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Apr.
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Marsden C. Smith, Director of the Department of Public Utilities of Richmond, Virginia, is a leader in his field. More data on page 14.

This Good Roads Spreader Team

...CUTS PAVING COSTS IN HALF!

The "Odell" Aggregate and Asphalt Spreader—designed with the contractor in mind, features low initial cost and exceptionally fast operation. Greater capacity—faster spreading, with less man-power, results in savings of over 50% in spreading costs.

The many "Odell" features, including positive one-time spread-depth adjustment and smooth, clean spread pattern, eliminates the need for 5 and 6 man crews ... . results in lower operating costs.

The Good Roads Handy Aggregate Spreader—spreads from powder-fine carpet up to 3-inch depth. It completely eliminates the danger of streaks and spotty spread . . . automatic transmission permits forward and reverse operation without shifting or de-clutching. Micrometer spread depth control eliminates constant re-setting. Once set, it remains constant for the entire job.

For complete details and specifications on the Good Roads spreader team and how it can help cut your paving costs, see your nearest Good Roads distributor, or write to:

GOOD ROADS MACHINERY CORPORATION

MINERVA, OHIO

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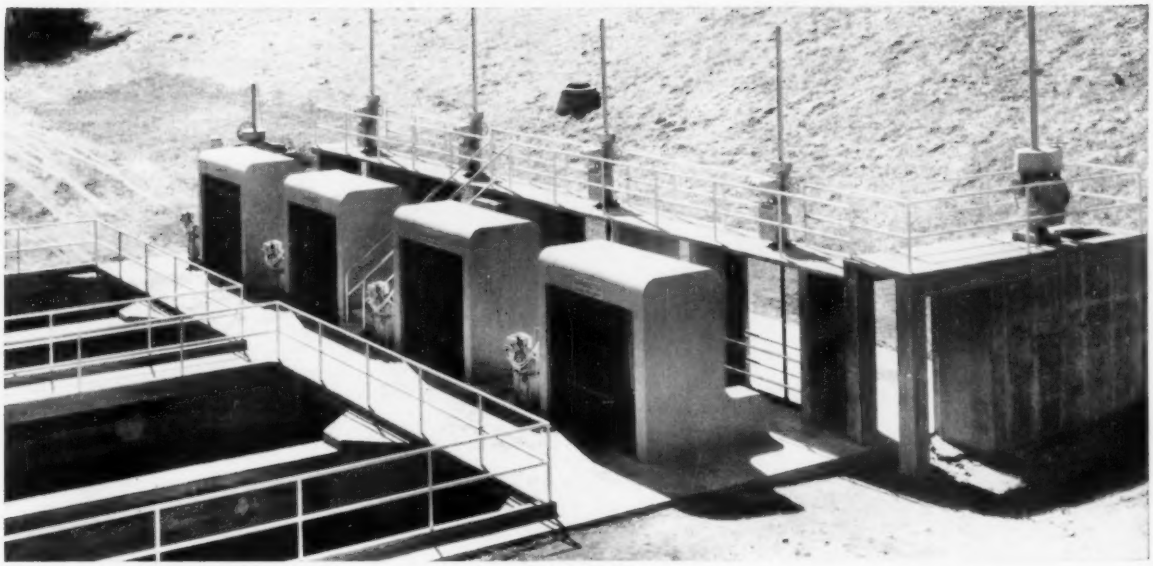


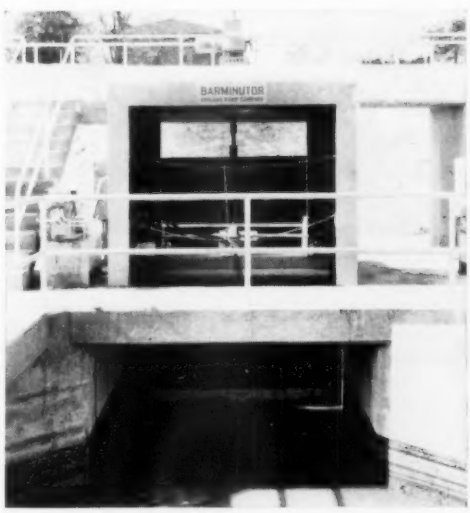
The illustration above shows the primary grit channels, four BARMINUTORS and motorized gates at the Indianapolis, Indiana sewage treatment plant. Design of plant by Moore and Heger, Consulting Engineers, Indianapolis; constructed by H. D. Tousley Company, Inc., Indianapolis, for the Indianapolis Sanitary District, Mr. Dwight O. Bender, Superintendent.

Comminution with BARMINUTORS® at Indianapolis

The BARMINUTOR screening and comminuting machine provides continuous screening and comminution of coarse material in sewage, insuring continuous raw sewage flow into the sewage treatment plant without excessive increase of water level.

Over 4000 COMMINUTOR screening and cutting machines installed since their development by the Chicago Pump Company 21 years ago stand behind the BARMINUTOR screening and comminuting machine. Thorough testing has also proved its dependability.

Write Department F for descriptive literature and engineering data.



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The BARMINUTOR screening and comminuting machine eliminates raking, burial, incineration and grinding. Operation is clean and continuous, solids never leave the influent channel. Manual attention is unnecessary except for periodic lubrication, inspection and cutter sharpening. Design of cutting parts permits low cost replacement. Power requirements are lower than for mechanically raked screens and grinders. Since all cutting is done above the grit line, wear is greatly reduced.

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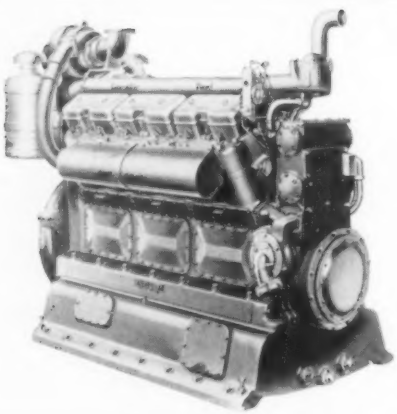
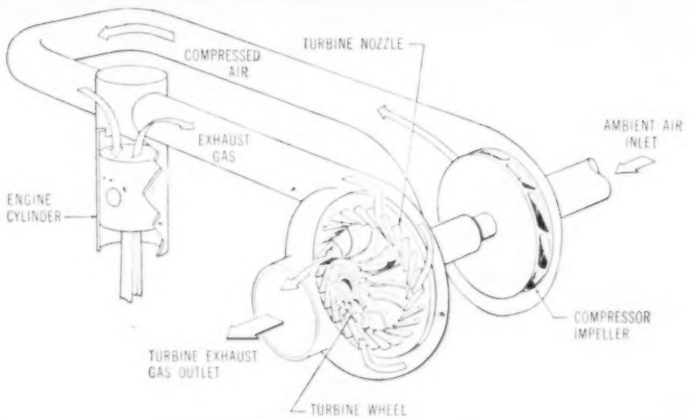
Compact, modern heavy-duty diesels for greater power, efficiency and economy!





The Cat D397 Turbocharged Engine

Both the D397 and the D375 are also available as *roots blown, naturally aspirated or spark ignited* engines.

The Turbocharger . . . Exhaust Gas and Air Flow

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More than eighteen years of research have gone into these two new CAT* Turbocharged Diesels. Incorporating metallurgical, mechanical and aerodynamic advances, they are engineered to deliver higher horsepowers and lower operating costs at reduced noise levels. Their advance-design features are also available in D397 and D375 Electric Sets and Marine Engines.

With these engines in the Caterpillar line-up, you now have an even wider choice of compact, modern heavy-duty power to meet your requirements. Get the complete facts about these two new Turbocharged Diesels from your Caterpillar Dealer!

Caterpillar Tractor Co., Peoria, Ill., U.S.A.

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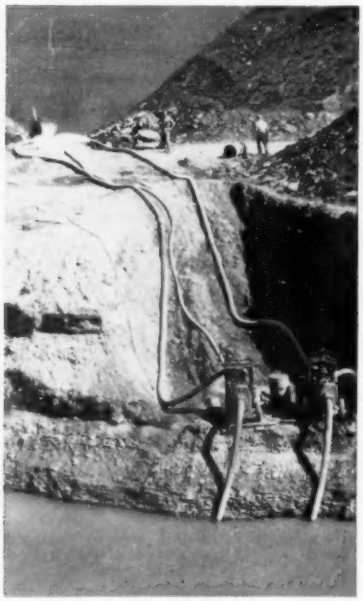
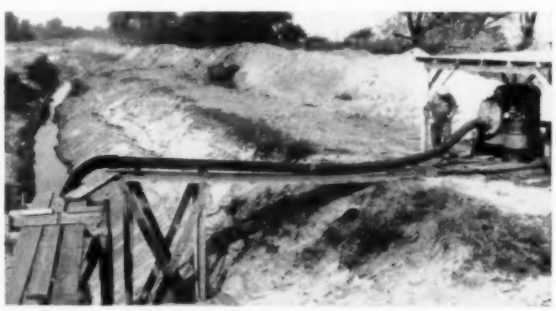
THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATES

DEWATERING COFFERDAM BELOW CUT-OFF POINT of timber piles for Wilmington River bridge piers on US 80, outside Savannah, Ga. After piles were driven to refusal, 8′ concrete tremie seal was poured. These two Jaeger 4″ pumps then unwatered cofferdam again for placement of 4′ reinforced concrete distribution block. Bridge has 14 of these twin-shaft piers. McMeekin Construction Co., Cheraw, S. C.



24-HOUR-A-DAY PUMPING for approximately 9 months each year for the past 3 years, demonstrates the dependability of this pair of Jaeger 6″ Sure-Prime Pumps. Aughenbaugh Coal Co. strip mine, Curwansville, Pa.

IN EXCAVATION for new Southdale Shopping Center, near Minneapolis, Minn., Johnson, Drake & Piper used this Jaeger 3P to pump inflow from spring into sewer line.



DIESEL POWERED 6″ PUMPS deliver rated 90,000 gph at efficient diesel engine speed of 1450 rpm. Ideal for continuous pumping of long ditches draining sand below Lake Erie water level for Erie, Pa., sewage disposal plant addition. Rust Engineering Co., Pittsburgh, Pa.

They bet their shirts on Jaeger Pumps

There are good reasons why such a high percentage of experienced contractors use Jaeger Sure-Prime pumps on their work. Size for size, your Jaeger Sure-Prime has a larger shell and impeller so that it holds more priming water and is subject to less concentrated wear. Its engine is of the highest horsepower applicable. You gain the advantage of two independent, simultaneous priming actions for fast, sure priming, and you prime and pump at slower, longer-life engine speeds. Some pumps run at 2000 rpm to do what a Jaeger does at 1400. This high efficiency is maintained by positively lubricated "Lubri-Seal" — the only pump seal that is provided with a ready-inspection port.

For 4000 to 240,000 gph capacities — or pressures to 275 psi — there's a Jaeger pump built to do your job. See your Jaeger distributor, or send for Catalog P4.

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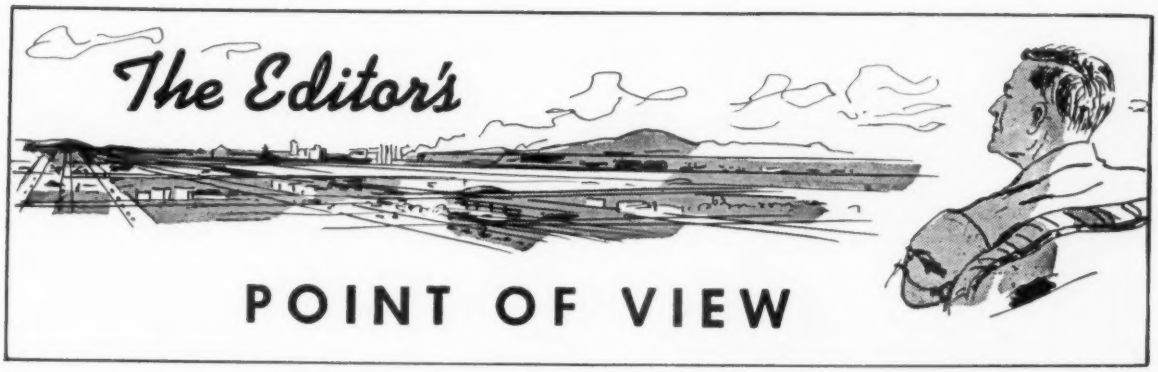


Civil Defense and Preparedness for Disasters and Emergencies

THOUGH IT may have seemed to many that the needs for civil defense have changed so many times and so markedly that sound policy determination for planning and for training of personnel has been difficult, the past year has given much cause for considering the needs for preparation against disasters. Floods and storms, especially the former, caused much damage. In many of these, local civil defense personnel proved their effectiveness. Rescue service, emergency communications and direction of traffic were a few of the many functions they rendered.

There are, of course, many other ways in which Nature can cause destruction; and, so far as is possible, these ought to be anticipated in planning and training. All of this ties in with civil defense, which is meant to guard against the biggest potential disaster of them all. Planning also for natural disasters can add realism, and perhaps local interest, to the job of organizing a civil defense program and keeping the volunteers in it interested enough to donate a lot of time and effort to the program.

We Need More Highways; But Let's Use Those We Have Most Effectively

TO BUILD THE many more miles of roads we need will take a long time; and then we will have more cars and will need even more roads. In the meantime, we must use the highways we have most effectively. Among the valuable means readily available are signs, signals, striping and the other tools of the traffic engineer. Also, betterment can be obtained quickly by climbing lanes for trucks, judicious widening, improving curves and intersections, constructing or developing bypasses around bottlenecks and improving our bridges; and much of this can be accomplished by light construction. And always, the surface must be kept in good condition, free from holes and bumps.

These low-cost means to more efficient use of our existing highways are available to practically every city, county and township. Procedures and equipment have been developed. There is no advantage in delay.

A Grumbling Pavement Surface as a Warning Measure

SOME YEARS ago there was a mild tendency to use rough sections of pavement to slow down motorists just ahead of bad intersections or other danger points. Now the use of a "grumbling" surface is being tried out. Of course, this is not a new idea for noisy dividers and curbs are used on some high-capacity highways, but the idea can be useful. There are so many things to look out for in traffic today that a warning sign may be missed, especially if it lacks visibility, unless there is a special method of calling attention to it. The noise-making pavement can do this and it is easy to build, for the grumbling surface can be applied in a variety of ways, making it applicable to rural areas and small cities as well.

Better Sewage Disposal for Residential Developments

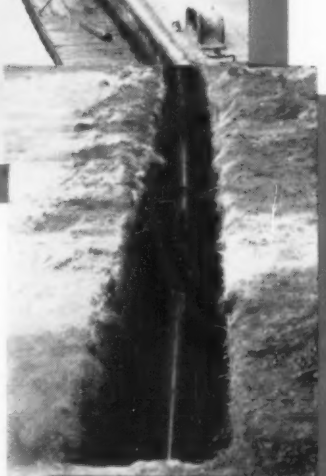
IT HAS BEEN estimated that about one-third of all residences now being constructed will utilize septic tanks and disposal fields for sewage disposal. Because many of these installations will be in areas where satisfactory operation of such devices is practically impossible, this means many headaches, much expense and at least some hazard to health.

Small sewage treatment plants are better, by far; and in many cases the first cost will be no greater than for individual tank and tile field installations. Values of homes increase when sewers and a treatment plant are available—generally enough to pay for the first cost of the treatment plant.

What are we waiting for? Generally we need a several-pronged attack. More widely available data on the design of small sewage treatment plants; a broad and firm educational policy on the part of State Boards of Health; and far more backbone on the part of local governments, including local boards of health. Perhaps also we need to have State sanitary engineering staffs forget their preference for one big plant an undetermined number of years hence, with the accompanying coldish shoulder for the small plant which is possible now.

You play safe when you lay

River crossing of cast iron pipe line to carry sewage to disposal plant at Portland, Oregon.

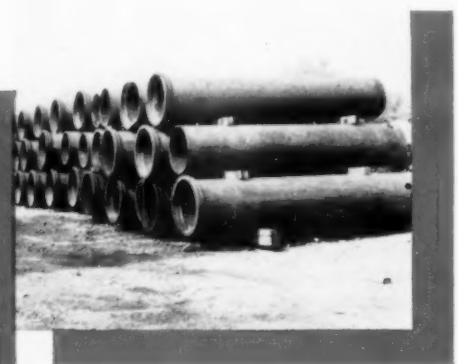


Installation of mechanical joint cast iron pipe for gas distribution at Syracuse, Nebraska.

Cast Iron pipe has long been recognized throughout the engineering profession as a rugged and adaptable material with proved ability to survive beam, compressive and shock stresses. Today's *modernized* cast iron pipe—centrifugally cast—is even tougher, stronger and more uniform in quality. Its effective resistance to corrosion, plus high strength factors, ensure long life with minimum maintenance cost. Yes, you play safe when you lay cast iron pipe—from your own standpoint and that of the taxpayers you serve. For further information, write Cast Iron Pipe Research Association, Thomas F. Wolfe, Managing Director, 122 So. Michigan Avenue, Chicago 3, Illinois.

CAST Q IRON®

The Q-Check stencilled on pipe is the Registered Service Mark of the Cast Iron Pipe Research Association.



About a half-mile of 49-year-old 24" cast iron pipe dug up, cleaned and re-laid by Cincinnati, Ohio, Water Department.

CAST IRON PIPE

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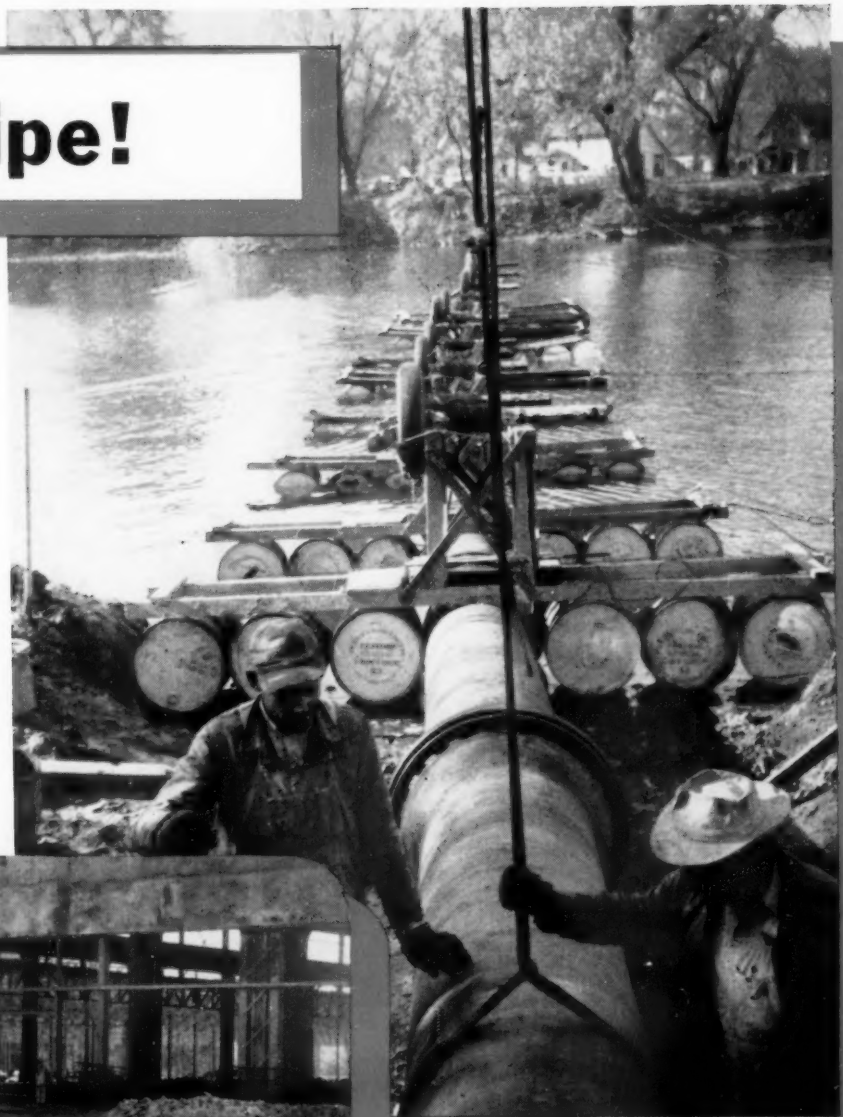
this pipe!



Flexible joint cast iron pipe being installed across Cedar River at Cedar Rapids, Iowa.

Cast iron pipe for large automobile assembly plant in New Jersey.

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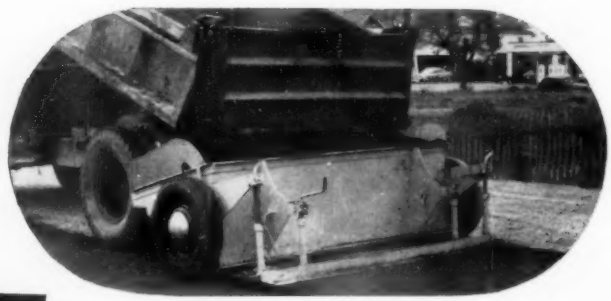
Get full details of this month's products . . . mail your Readers' Service card today.

NEW LITTLEFORD TRUE-LAY PAVER-SPREADER...

lays 100 tons of bituminous concrete per hour

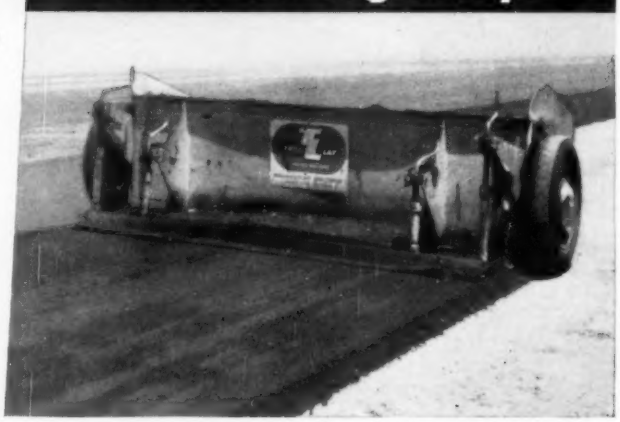


...in driveways

Does more things better:

1. Lays mat from 4-ft to 10-ft wide, up to 6" in depth
2. Spreads 4" maximum size stone, too
3. Compaction equals up to 80% of mechanical tamper
4. Cuts labor costs 65%
5. Paves close to curb or buildings

...or on highways



The 2-in-1 Littleford True-Lay tow type paver-spreader is designed for paving bituminous concrete in driveways, alleys and confined areas where heavy, cumbersome units won't fit. Operates efficiently and profitably in the wide open spaces, too. Cuts labor costs up to 65% and will quickly pay for itself. For complete information, send today for bulletin GG-33, Littleford Bros., Inc., 452 E. Pearl St., Cincinnati 2, Ohio

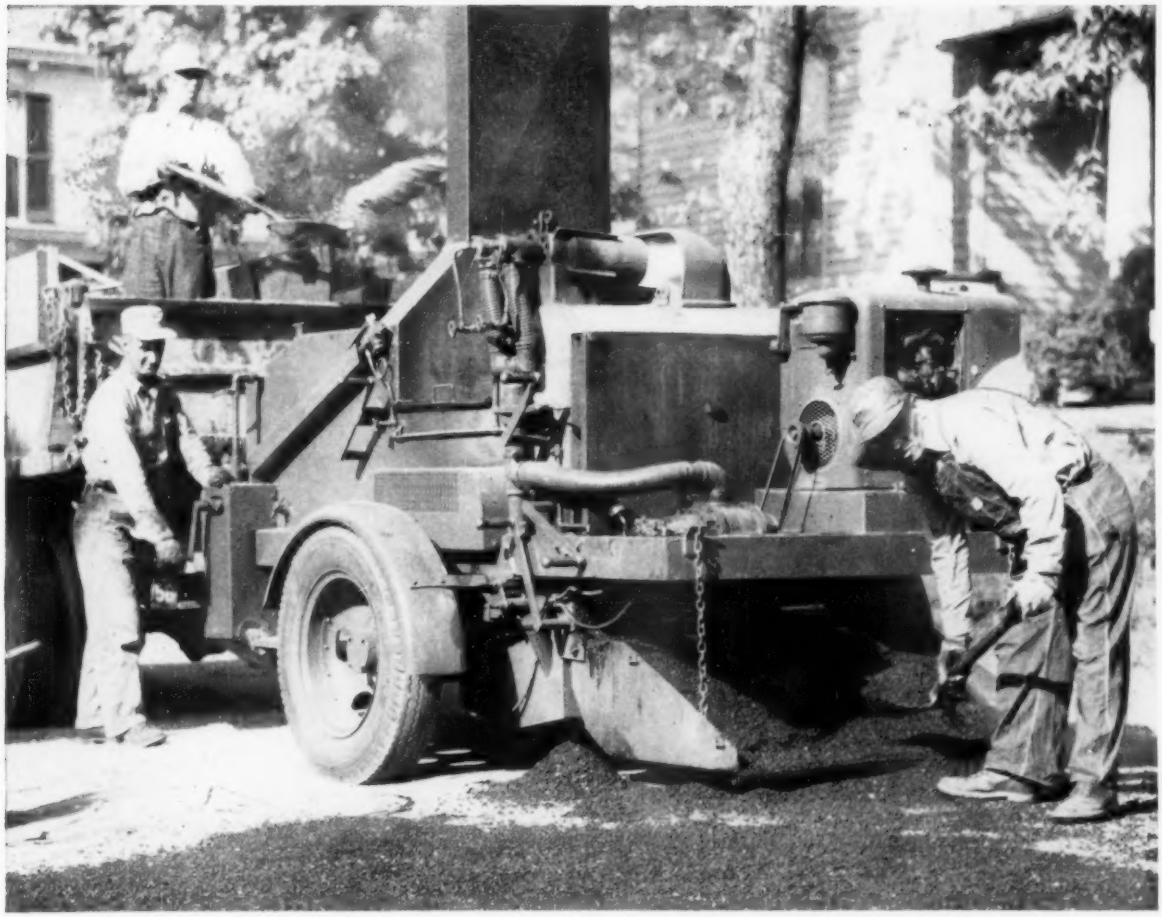
LB LITTLEFORD

Fastens to front bumper of any standard dump truck.

Wheel adjusted to ride on top of last pass

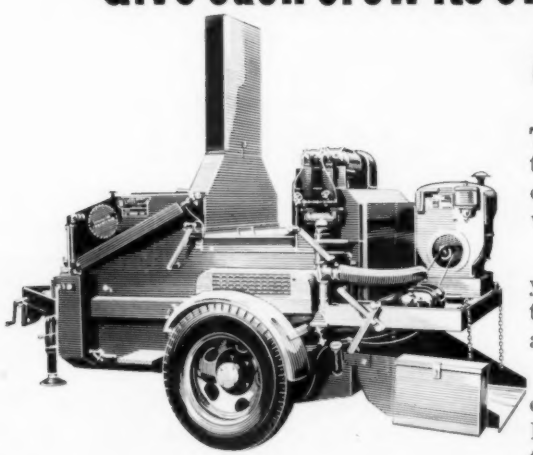
Carried on dump truck gate.

Now's the time to mail this month's Readers' Service Card.



Give each crew its own asphalt plant

and save $1.82 on every ton!



The Littleford Trail-O-Patcher is a complete, self-contained portable asphalt plant. It's so convenient and economical, you can afford to provide each of your crews with its own bituminous mixer.

In fact, when you consider the $1.82* per ton saving, you can't afford not to keep several Trail-O-Patchers on the job continuously. You can mix as much as you want, anywhere and at any time of the year.

To appreciate the full significance of the increased convenience, efficiency and economy the Littleford Trail-O-Patcher now makes possible in bituminous mixing, send today for your free copy of bulletin 28.

*$7.00 From asphalt plant
5.18 Trail-O-Patcher mix
$1.82 savings per ton

BLACK TOP ROAD EQUIPMENT LB SINCE – 1900

LITTLEFORD *Tops in Black Top!*

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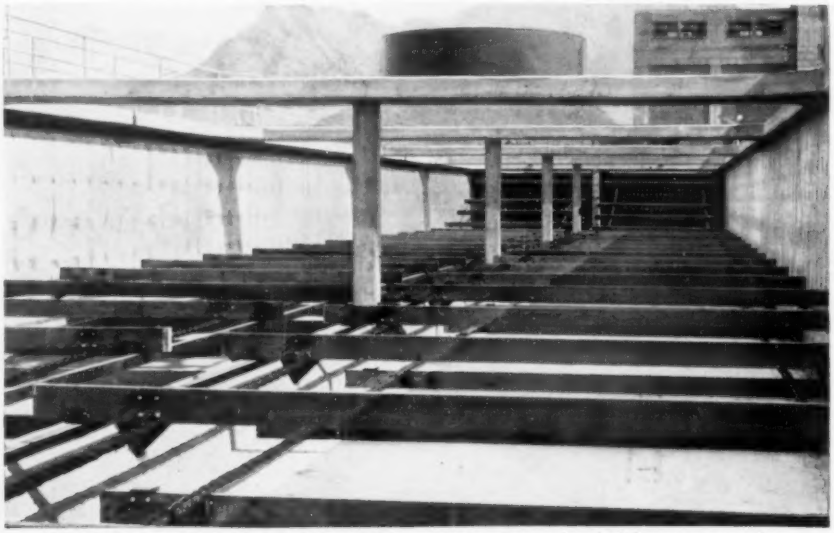
CIRCULINE COLLECTORS for square or round tanks provide quick, positive removal of sludge and dense sludge with lowest possible water content.

TRASH SCREENS are operated intermittently, and remove large floating debris to protect water screens and other equipment from damage.



Population expansion called for 30-mgd addition to treatment facilities at this plant. By adding Link-Belt chemical mixing and flocculation equipment, system can now handle 40 mgd in emergencies. And from a master plan projected to year 2000, further extensions and increased capacity can be accomplished with minimum changeover.

Plan for the years ahead

with LINK-BELT water treatment equipment

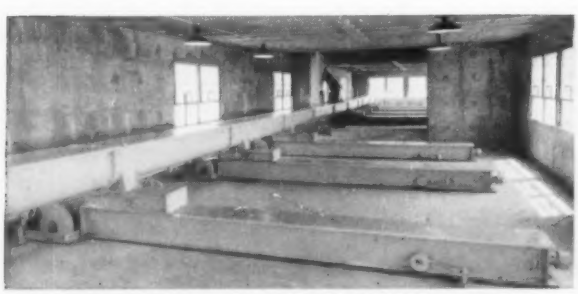
FLASH MIXERS continuously, rapidly and thoroughly mix chemicals prior to flocculation . . . prepare chemicals and water for immediate flocculation.

TODAY, more and more water purification systems are being built with consideration for future as well as present needs. Hence, dependability of equipment takes on added importance in reducing chemical and operational costs and more efficient operation. And Link-Belt is helping to meet these requirements—offering a broad range of long-life equipment that permits expansion of capacity with a minimum of changeover.

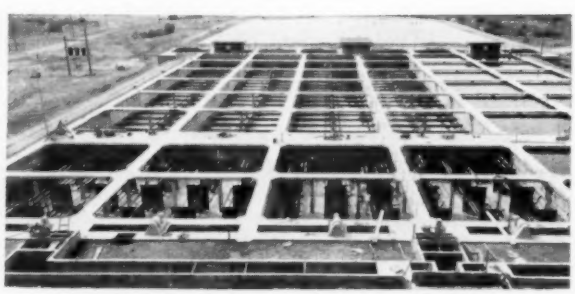
Our sanitary engineers will work with your own engineers, chemists and consultants. For further details, call your nearest Link-Belt office.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT



SCREW CONVEYORS AND BUCKET ELEVATORS efficiently handle chemicals. This system in chemical building distributes lime or alum to storage bins.

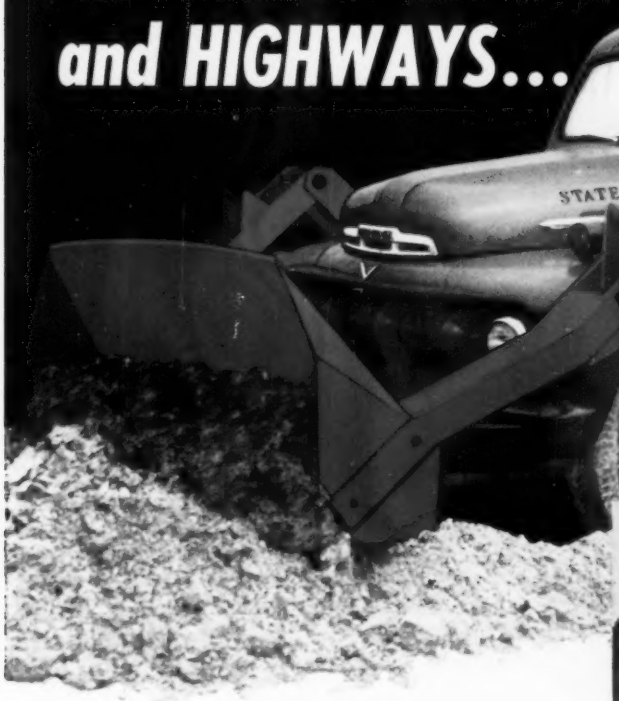


STRAIGHTLINE MIXERS are used in flocculation tanks (foreground), while Straightline sludge collectors and cross collectors are installed in settling tanks.

LINK-BELT COMPANY: Executive Offices, Prudential Plaza, Chicago 1. To Serve Industry There Are Link-Belt Plants and Sales Offices in All Principal Cities. Export Office, New York 7; Canada, Scarboro (Toronto 13); Australia, Marrickville, N.S.W.; South Africa, Springs. Representatives Throughout the World. 14,083

Thousands use our Readers' Service card to keep up to date . . . do you?

REDUCES COST of WORK on STREETS and HIGHWAYS...



SAVES UP TO 50% on Some Jobs

Today, states, counties, and municipalities throughout the nation are successfully reducing the high cost of maintenance work on streets, roads, and highways with Holmes-Owen truck loaders. Use of the standard type loader, such as shown above, can substantially lower the cost of many jobs by simply cutting down on the number of men and equipment needed for such work. With this unit, one man handles all operations. The truck driver LOADS, HAULS, and DUMPS. He does light digging, grading, and cleaning up, without additional man power or the use of more costly equipment. A truck with such versatile one man operations has many practical uses that can easily lower job cost and actually save thousands of dollars annually for users. The standard loader is hydraulically operated, lifts ½ yard per bucket, loads the average truck in 4 minutes, and can be installed on most 1½ to 2 ton trucks using the standard dump body. See your equipment dealer or write factory for details.

New Forward-Tipping Bucket Broadens USE of LOADER

The Holmes-Owen loader is now available with a new forward tipping bucket that not only improves digging and shoveling operations, but permits the unit to be used for loading other vehicles. This feature considerably broadens the loader's use. It enables the unit to work independently–either loading, hauling or dumping; or, as a unit for loading other trucks. The new type bucket is powered by two double acting cylinders and can be easily rotated to any position up to 120 degrees. The entire loader is hydraulically operated and can be installed on most 1½ to 2 ton trucks. See your dealer or write factory for details.

ERNEST HOLMES COMPANY
Chattanooga Tennessee

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

FASTER, MORE ACCURATE CONTROL FOR "Stop and Go" UTILITY DITCHING

ONLY Gar Wood Buckeye **HAS IT!**

Utility ditching requires frequent changes in travel and digging speeds for work in close quarters . . . frequent raising and lowering of digging wheel to protect existing pipe, cable and conduit. For "stop and go" work like this, Gar Wood-Buckeye's new job-proved 305 offers exclusive advantages:

Live hydraulic wheel hoist provides faster, more accurate positioning of the digging wheel, independent of all other operations. It's operated from the seat by simple, one-hand controls.

Hydraulic conveyor drive provides three discharge speeds in either direction . . . instant adjustment to handle any volume of spoil independent of any other function. No complicated shifting, no need to stop digging wheel or crawlers.

Track-type crawlers on the 305 let you dig regardless of ground conditions . . . tread lightly to protect lawns and sidewalks . . . last longer, cost less to maintain. Transmission is specially designed for "stop and go" operations...any travel speed can be obtained with any digging wheel speed.

The 305 digs to 5 feet, 6 inches deep; 12 to 24 inches wide in 2-inch steps. To get all the facts about this advanced ditcher, call your Gar Wood-Buckeye dealer, or write: Customer Service Department, Gar Wood Industries, Inc., Wayne, Michigan.

GAR WOOD INDUSTRIES, INC.

Wayne, Michigan • Findlay, Ohio

Plants in Wayne and Ypsilanti, Mich.; Findlay, Ohio; Mattoon, Ill.; Richmond, Calif.

Gar Wood Truck Cranes | Gar Wood Winches | Gar Wood-Buckeye Ditchers | Gar Wood Truck-Mounted Cranes | Gar Wood-St.Paul Hoists & Bodies

Get full details of this month's products . . . mail your Readers' Service card today.

LEADER IN PUBLIC WORKS

★

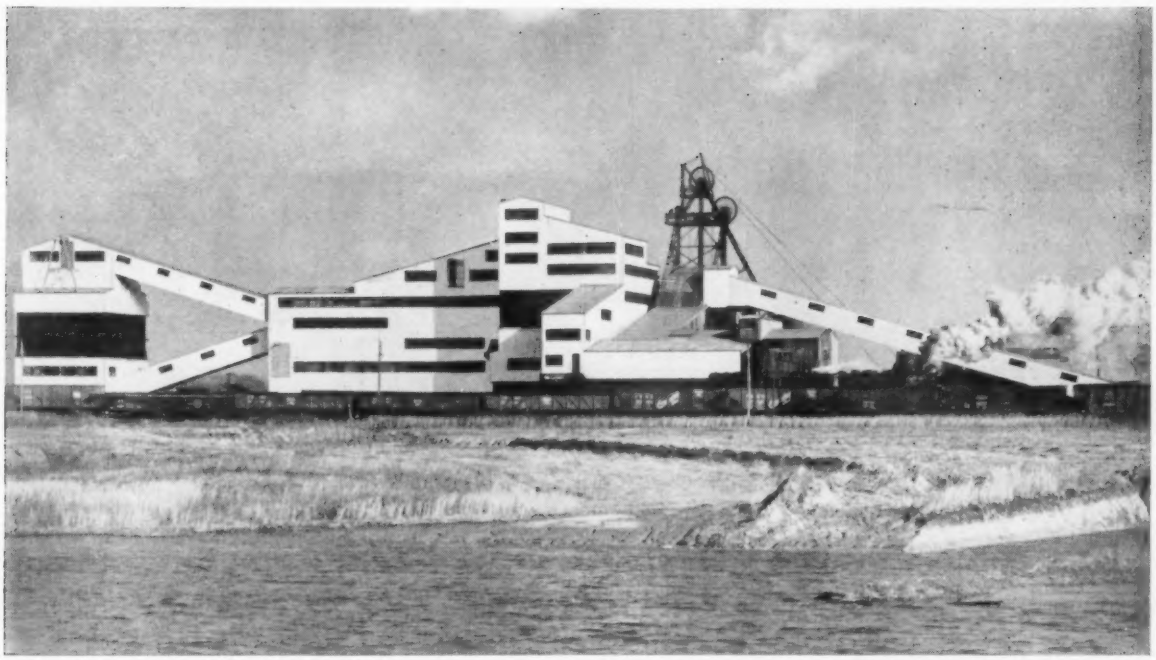
Marsden C. Smith, Director of the Department of Public Utilities of Richmond, Va., has the distinction of being perpetuated in bronze while still living. When some 'Old Grads' of the Virginia Military Institute decided to erect a monument on the Campus to General Francis H. Smith, the co-founder and first superintendent of the Institute, Mr. Smith was selected as the model because his figure was most nearly that of his noted grandfather.

Mr. Smith was graduated from the Virginia Polytechnic Institute in 1911 in electrical engineering, the Virginia Military Institute then not offering such a course. His experience has since broadened to include the fields of gas and water, as applied to municipal work, as well as electricity.

He has contributed many new ideas to his original profession and latterly to the water supply industry. He is recognized as a pioneer in mechanical flocculation and better pretreatment of water and recently has developed an automatic control for the pumping of fluids.

He has been active in the affairs of the AWWA, serving as chairman of the Purification Division and on numerous committees. He has been a frequent participant in water works programs and a contributor to numerous publications.

Richmond's utilities have long been recognized as being among the best and Marsden Smith's forty-one years with that City have given him a fine opportunity to serve his beloved home town.



This gleaming, modern coal preparation plant at Valier, Illinois, made of Kaiser Aluminum, was built for The Old Ben Coal Corp. by the McNally Pittsburgh Mfg. Corp., Pittsburgh, Kansas.

"No building maintenance problems with Kaiser Aluminum roofing and siding"

says Mr. J. W. MacDonald, Vice-President Engineering,

The Old Ben Coal Corp., Christopher, Illinois

"FUMES AND GASES seem to have no effect on our corrugated aluminum coal-preparation plant. It is completely rust-proof and never needs painting or any other expensive upkeep.

"That's particularly important in the coal industry where building maintenance is often a major item of cost.

"We like the way that aluminum keeps the interior cool on hot summer days.

"In our opinion, aluminum is the ideal building material for coal-processing plants. A recent contract for another preparation plant will again require provision of corrugated industrial aluminum roofing and siding."

Not only does Kaiser Aluminum Industrial Roofing provide greater protection and lower maintenance . . . it also assures *immediate savings*. Its light weight reduces transportation and handling costs. And it often requires lighter, less expensive supporting structures.

Whatever you're building—figure first in Kaiser Aluminum—for better value at lower cost! For A.I.A. File and complete information, contact any Kaiser Aluminum sales office listed in your telephone directory. Or write Kaiser Aluminum & Chemical Sales, Inc. *General Sales Office*, Palmolive Bldg., Chicago 11, Illinois; *Executive Office*, Kaiser Bldg., Oakland 12, California.

Kaiser Aluminum

Industrial Roofing and Siding

Light Weight—Reduces transportation costs. So easy to handle that construction is faster, lower in cost. Often permits the use of lighter, less expensive framing.

Strong—The increased depth (7/8") of the corrugations of Kaiser Aluminum sheet provides greater load carrying capacities over the longer spans of modern industrial construction.

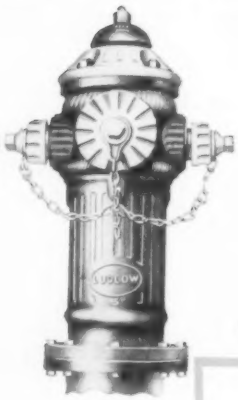
Corrosion Resistance—High resistance to most industrial fumes. Can't streak with red rust. Maintains attractive appearance indefinitely.

Low Maintenance—Never needs painting. Resists heavy winds and hail.

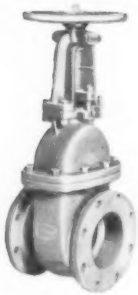
Cooler, Brighter Interiors—By reflecting hot sun rays, aluminum keeps interiors as much as 15° cooler. Aluminum's high reflectivity insures extra interior light.

Now's the time to mail this month's Readers' Service Card.

LIST 90-0



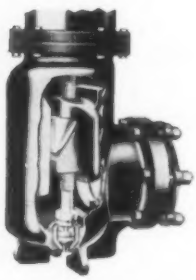
LIST 75-0



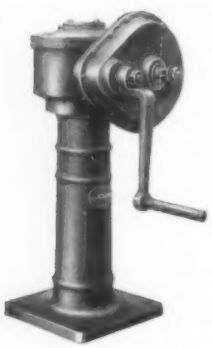
O.S. & Y VALVE

NRS VALVE

GEARED VALVE



FIRE HYDRANTS



FLOOR STAND

INDICATOR

THE MARKET PLACE FOR QUALITY VALVES

The consolidation of two great valve companies with a combined experience of more than 165 years devoted primarily to the manufacture of water works valves and hydrants now provides the most extensive market place in the industry.

A.W.W.A. VALVES AND HYDRANTS: with several types of each to choose from with a complete line of valve ends in every size required and backed by the combined engineering, manufacturing and application resources of both companies.

LARGE AND SPECIAL VALVES FOR LOW AND HIGH PRESSURE SERVICE: up to 72″, fabricated with the most modern foundry and machine shop equipment, recently expanded.

SQUARE BOTTOM VALVES: from 4 to 48″, designed and built to stand up under the severe conditions of automatic operation, throttling and constant opening and closing.

13

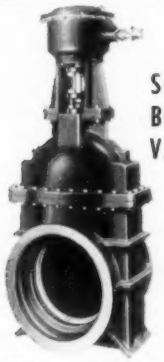
THE LUDLOW

VALVE MFG. CO., INC. TROY, N.Y.

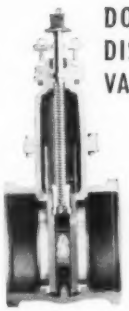
TRADE LUDLOW MARK

GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES
CHECK VALVES • TAPPING SLEEVES • AIR RELEASE VALVES

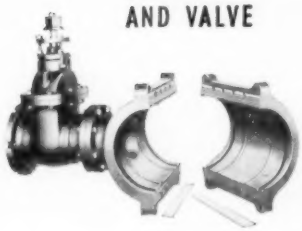
Need more facts about advertised products? Mail your Readers' Service card now.



SQUARE BOTTOM VALVE



DOUBLE DISC VALVE



TAPPING SLEEVE AND VALVE

MOTOR OPERATED VALVE

ACCESSORIES: Where experience counts most—the selection of by-passes, automatic, electric or hydraulic operation and countless highly special equipment for the pumping plant.

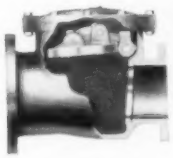
TAPPING SLEEVES AND VALVES: up to 48″, that insure speed, safety and low costs when cutting valves into the lines.

CHECK VALVES: insure against slam on pump shutdowns. Clearway-quiet closing, single disc. Sizes up to 30″ with or without lever arm and spring.

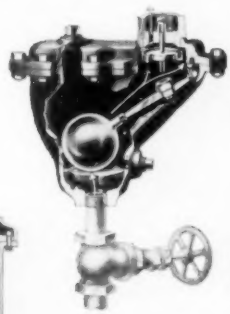
AIR VALVES: a combined air-and-vacuum and air release valve that allows air to escape when filling the lines and air to prevent vacuum when emptying. Also used on air tanks, booster bowls and turbine pump discharge.

SERVICE: The names Ludlow and Rensselaer mean the same today that they have during your lifetime. The desire to serve the Water Works Field in person—in research and design and in prompt delivery of original equipment and spare parts for all products has not changed. On the other hand, our ability to serve has at least doubled.

14



CHECK VALVE



AIR VALVE

FIRE HYDRANT

Bulletins available on all equipment, replacement parts and accessories.

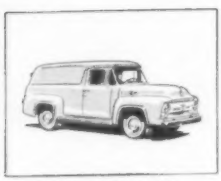
Rensselaer VALVE CO.

TROY, NEW YORK

DIVISION OF THE LUDLOW VALVE MANUFACTURING CO., INC.

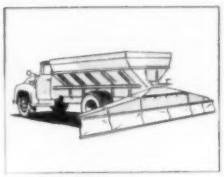
GATE VALVES • FIRE HYDRANTS • SQUARE BOTTOM VALVES
CHECK VALVES • TAPPING SLEEVES • AIR RELEASE VALVES

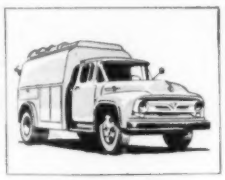
Thousands use our Readers' Service card to keep up to date . . . do you?


SERVICE PANEL

FIRE TRUCK

SCHOOL BUS


LIME SPREADER


UTILITY TRUCK

For any Public Works job —

Best for miles of extra life, with extra-strong truck chassis

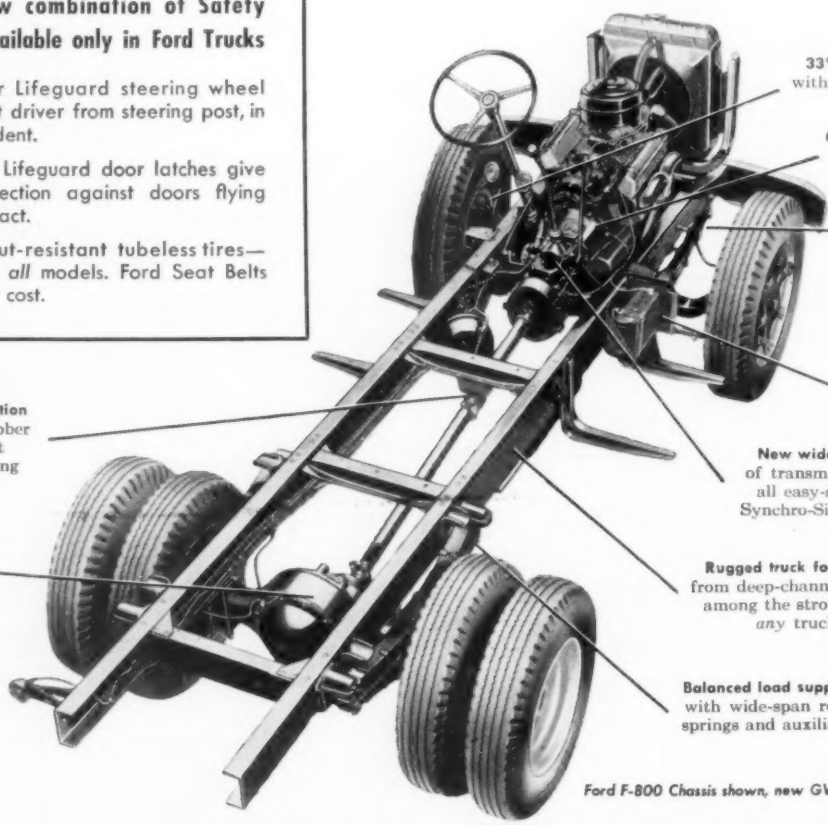
'56 FORD TRUCKS have extra strength in every vital chassis part. New, huskier axles and longer-lived brakes and clutches on many models mean even more service miles for the trucks that *outlast every other leading make* (as studies by insurance actuaries prove).

With a new combination of Safety Features available only in Ford Trucks

Deep-center Lifeguard steering wheel helps protect driver from steering post, in case of accident.

Double-grip Lifeguard door latches give added protection against doors flying open on impact.

New blowout-resistant tubeless tires—standard on *all* models. Ford Seat Belts at low extra cost.



33% longer brake life with new thicker linings

Long-lasting Gyro-Grip clutch with low pedal pressure

Easy-action front springs with double-wrapped rear eyes for added safety

Faster starts, longer life with new 12-volt electrical system

New wide choice of transmissions—all easy-shifting Synchro-Silent type

Rugged truck foundation from deep-channel frames, among the strongest on *any* trucks

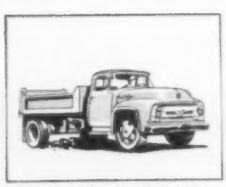
Balanced load support with wide-span rear springs and auxiliary

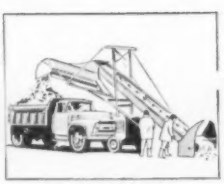
80% less vibration with thick-rubber prop shaft center bearing

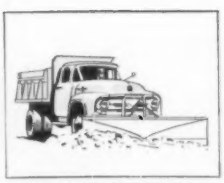
Strong, one-piece banjo-type rear axle housing

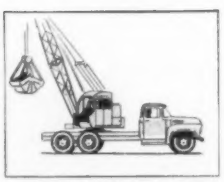
Ford F-800 Chassis shown, new GVW 24,000 lbs.

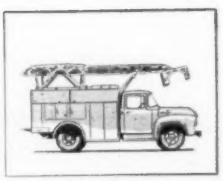
Every major body builder builds for Ford


DUMP WITH SCRAPER


DUMP TRUCK

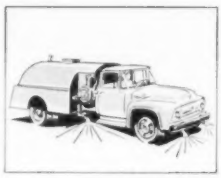

DUMP WITH SNOW PLOW

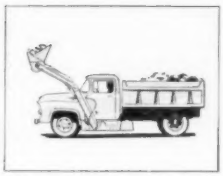

TRUCK-MOUNTED CRANE


LINE TRUCK

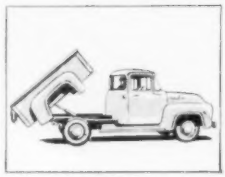
It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

REFUSE COLLECTOR


STREET FLUSHER


REFUSE COLLECTOR

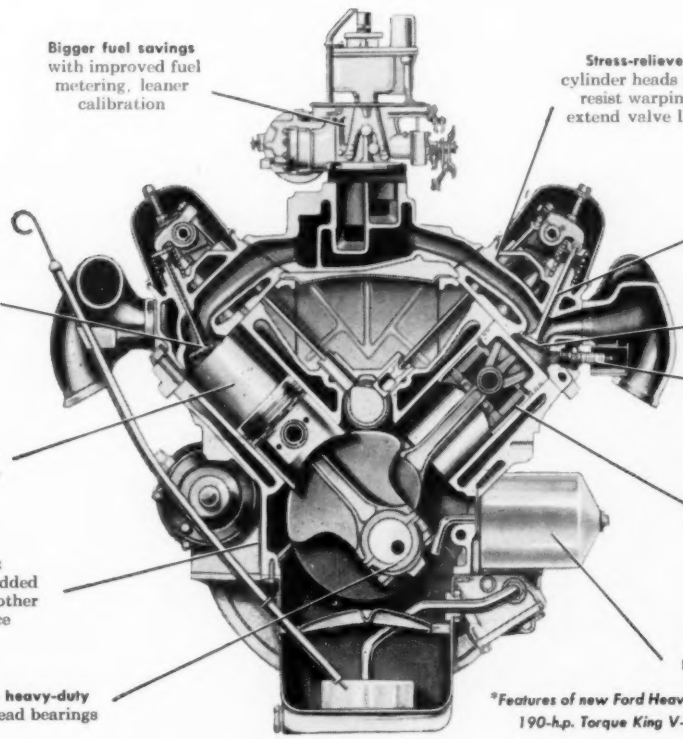
LIGHT UTILITY


LIGHT-DUTY DUMP

Ford Trucks work the best!

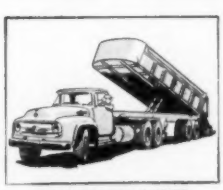
Best for economical operation, long life and low upkeep, with more horsepower per dollar, more heavy-duty haul-ability

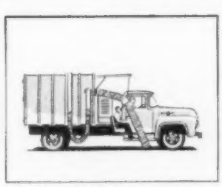
'56 FORD TRUCKS offer more horsepower per dollar than any other full truck line ranging from pickups to 65,000-lb. GCW BIG JOBS—proved by comparisons of net horsepower and suggested list prices of *all* trucks! Prove it to yourself by putting a '56 Ford Truck to work on your job.

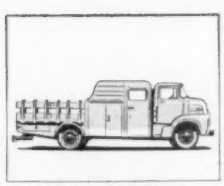

Bigger fuel savings with improved fuel metering, leaner calibration
Stress-relieved cylinder heads that resist warping, extend valve life*
225° cooler valves —new sodium-cooled exhaust valves with tungsten-cobalt facing*
Durable, self-cleaning free-turn valves
Anti-fouling 18-mm. spark plugs with new long-life electrodes
Expansion-controlled pistons with integral steel struts
Full-flow oil filter to clean *all* the oil for longer engine life
Self-Sealing dish-type intake valves for tighter fit*
Short Stroke design in *every* engine for greater gas savings, longer life
Deep-block structure for added strength, smoother performance
Durable heavy-duty copper-lead bearings

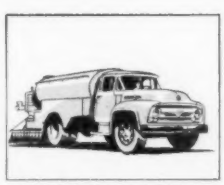
**Features of new Ford Heavy Duty engines . . . 190-h.p. Torque King V-8 shown.*

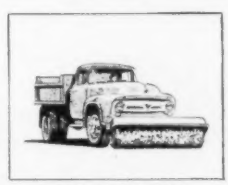
Your Ford Dealer will be glad to help you


TRAILERIZED DUMP

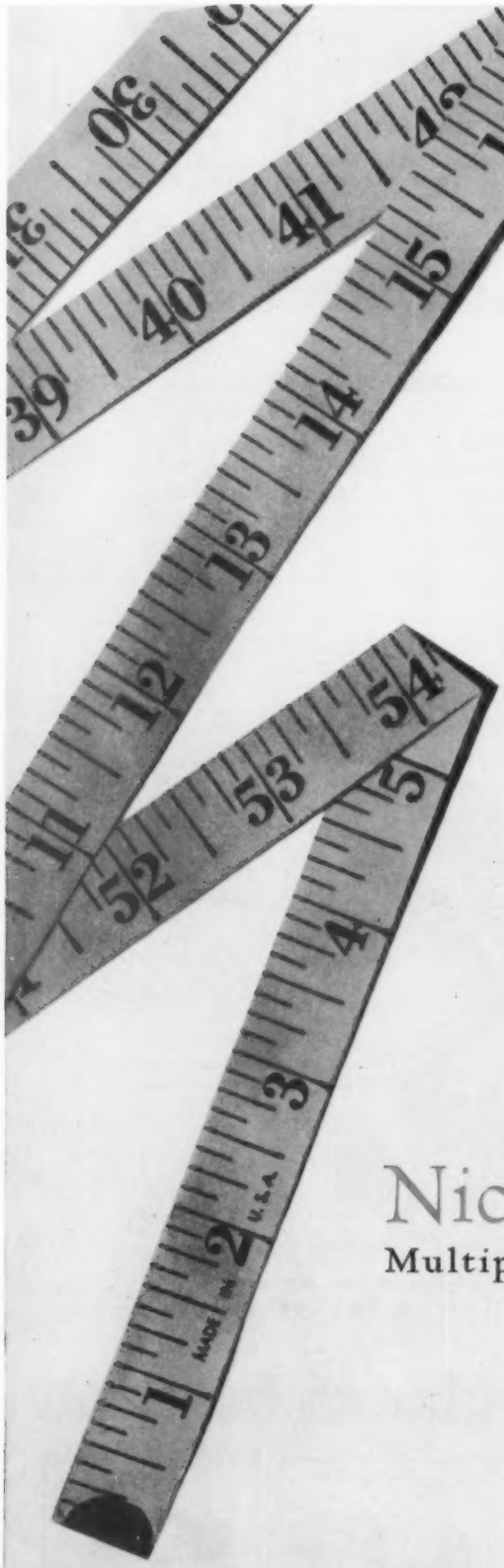

STREET CLEANER


FORESTRY SERVICE


BITUMINOUS DISTRIBUTOR


DUMP WITH BRUSH

Get full details of this month's products . . . mail your Readers' Service card today.



How do you measure Economy?

Economy means many things to many people. To Herreshoff furnace users it means low operating and low maintenance costs, dependability and efficiency.

The Nichols Herreshoff Furnace dries sludge or will burn a mixture of sludge, grits, grease and screenings.

By every measurement the Nichols Herreshoff system of sewage solids disposal offers the greatest economy.

Nichols Herreshoff

Multiple Hearth Dryer - Incinerators

Nichols Engineering & Research Corp.
70 Pine St., New York 5, N. Y.
1637 N. Illinois St., Indianapolis 2, Ind.
1477 Sherbrooke St., W., Montreal 25, Canada

. . . and Nichols Monohearth Mechanically Stoked Refuse Incinerators

Thousands use our Readers' Service card to keep up to date . . . do you?

Allis-Chalmers model D

THE LOW-COST MOTOR GRADER THAT OFFERS more of everything...

more PRODUCTION-BOOSTING FEATURES

Choice of Allis-Chalmers engines

GASOLINE — 50 brake hp. Bare grader weight —8,800 lb. Four forward speeds to 25.6 mph, one reverse to 3.3 mph.

DIESEL — 50 brake hp. Bare grader weight — 9,350 lb. Four forward speeds to 25.2 mph, one reverse to 3.2 mph.

ROLL-AWAY moldboard rolls the load instead of pushing it, moves more dirt, uses less power.

Plus one-piece tubular frame, tandem drive, real operator comfort, hydraulic blade lift.

USEFUL OPTIONAL FEATURES

Power circle turn for faster, easier, better control of blade . . . turns 135 degrees.

Leaning front wheels with heavy-duty axle, for better control in close quarter-work.

Hydraulically shiftable moldboard to speed work around obstructions. Shifts 16 in. each way.

Special large tires for added traction, long wear. Front (7.50-20 or 8.25-20) and rear (8.25-20).

more JOB-MULTIPLYING ATTACHMENTS

Hydraulic scarifier, mounted amidships for maximum effective ground pressure.

Shoulder maintainer for safe, one-pass operation. Also available: one-pass windrow eliminator.

Rear-mounted 5/8-yd loader for fast, low-cost handling of materials.

plus snowplows, completely enclosed standup cab, hydraulically operated mower.

more SATISFIED USERS

Since its introduction in 1949, thousands of satisfied owners have *proved* the usefulness and low-cost versatility of the Model D on all kinds of construction and maintenance.

Call your Allis-Chalmers Construction Machinery Dealer for a demonstration today!

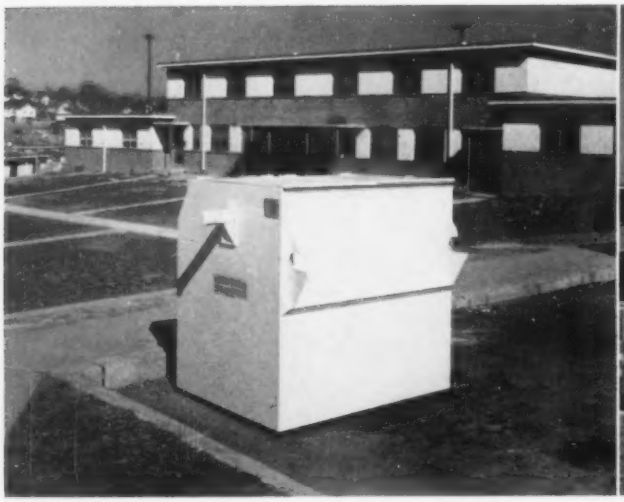
ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION
MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

ROLL-AWAY is an Allis-Chalmers trademark.

Need more facts about advertised products? Mail your Readers' Service card now.

NEW DEMPSTER-DUMPMASTER Front-end Refuse



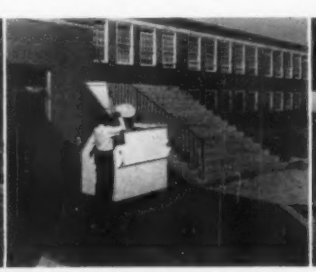
Revolutionary equipment serves scores of containers—picking each up hydraulically and emptying into compaction type body!

The Dempster-Dumpmaster's flexibility includes safe front-end-collection of refuse from conventional cans in alley pick up. Men are always in safe area in full sight of driver.

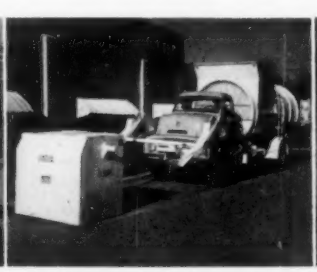
WITH THIS NEW Dempster-Dumpmaster for handling refuse in 1¼, 2 and 3 cu. yd. containers and the Dempster-Dumpster for handling bulk refuse in 6 to 15 cu. yd. containers, refuse collection is now a near-science! Necessity of operating several conventional trucks with crews is eliminated. Unsanitary, fire-hazardous and inadequate conventional trash cans, barrels, etc. can be removed from your business districts, housing and apartment areas, schools, hospitals, etc.

Where containers of limited capacity are preferred, the Dempster-Dumpmaster is the solution to the costly and unsanitary methods of collection because of a multitude of reasons, including: Detachable Containers always remain at accumulation point. They may be placed in or outside buildings. Only one man, the driver, is required for complete operation. It hydraulically picks up each container and dumps refuse into compaction type body for maximum loads. No equipment approaches its flexibility for general service, including safe alley pick up of refuse from conventional cans with only a 24-inch height for dumping cans, and with men always in full view of driver you have safe front-end-collection at all times. Too, it's faster because refuse is compacted while container is being loaded. By promising such extraordinary economies and meticulous sanitation, the Dempster-Dumpmaster merits thorough investigation by any city or town, regardless of size. Ask us to send you complete information. Dempster Brothers, Inc.

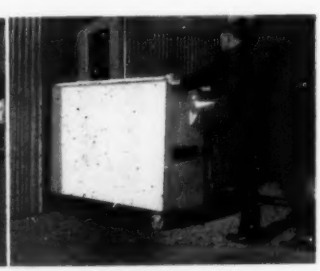
Filling Stations are one of many types of service establishments that need fire-proof Dempster-Dumpmaster Containers.



Schools, Hospitals are among the institutions that use these containers; benefiting by the sanitation and low cost.

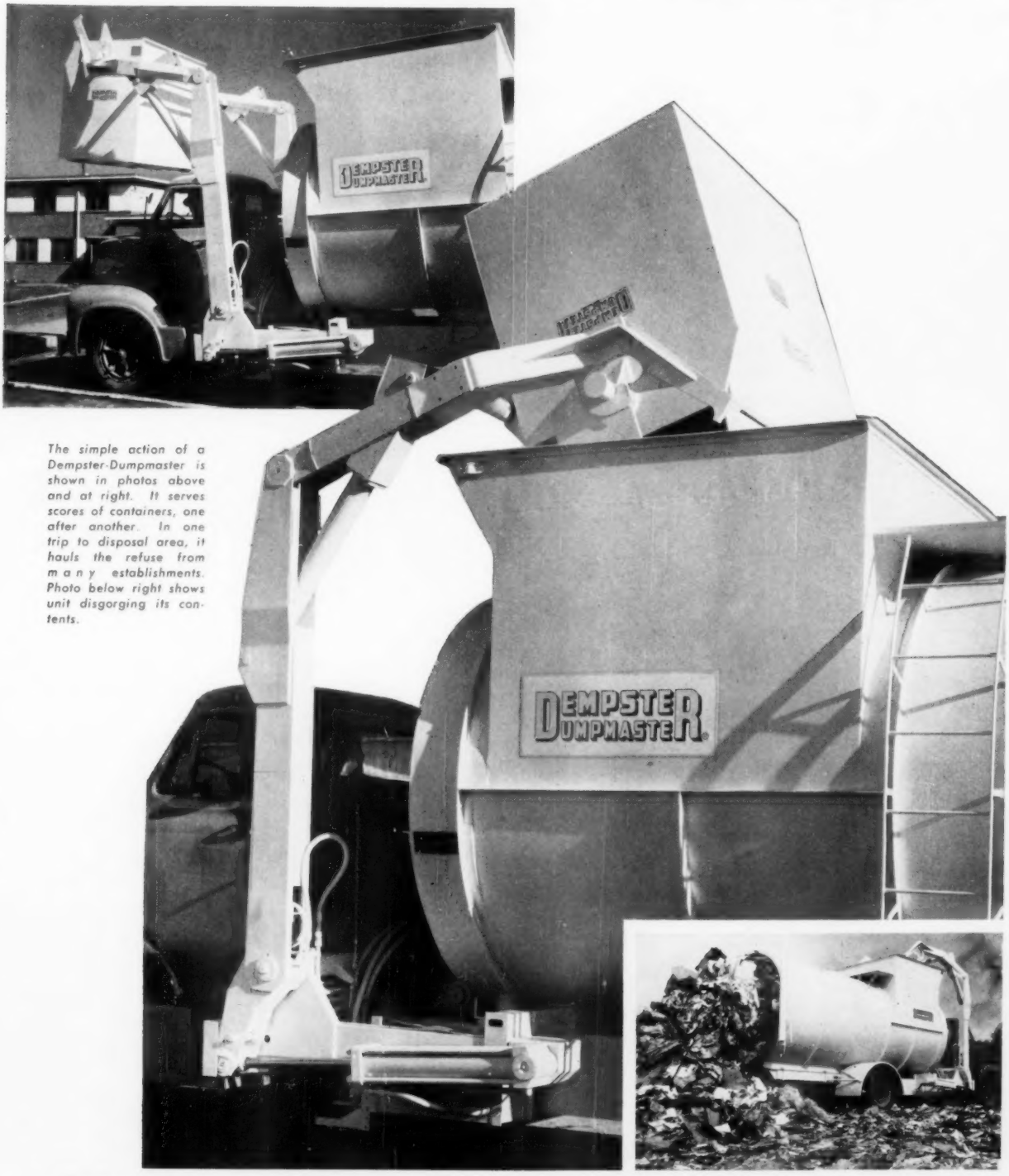


Restaurants are just one type of many business establishments in your city desiring these scavenger-proof, rat-proof containers.



Casters are available on Containers when needed for location at convenient refuse accumulation areas outside or inside buildings.

gives you Safe, Sanitary Collection at a New Low Cost!



The simple action of a Dempster-Dumpmaster is shown in photos above and at right. It serves scores of containers, one after another. In one trip to disposal area, it hauls the refuse from many establishments. Photo below right shows unit disgorging its contents.

DEMPSTER BROTHERS, 946 Dempster Bldg., Knoxville 17, Tennessee

TD-9 Four-In-One ..seals 525

and .... for other

Spreading and compacting refuse . . .

Stafford Township began this Sanitary Landfill refuse disposal operation May 1, 1955, on a site near Manahawkin, New Jersey. Private and municipal trucks collect refuse from nine townships and boroughs for an estimated summer population of 30,000. Daily collections average 35 loads, or 525 cubic yards of packed mixed refuse. An International® Drott TD-9 Four-In-One Skid-Shovel handles the fill operations. Their Four-In-One is a bulldozer, Bullclam, Skid-Shovel, or clamshell—at a fingertip flick of the "machine-selector" lever—on landfill, or dozens of other tax-saving duties!

Obtaining cover dirt as a Skid-Shovel . . .

Reports Clinton Sprague, TD-9 Four-In-One Skid-Shovel operator for Stafford Township:

> "We can put an even dirt cover over the compacted refuse without disturbing the layer—by using Drott Four-In-One Bullclam action. Four-In-One features make it ideal for sanitary fill jobs. We also use it for loading out trucks with gravel and dirt."

Their Four-In-One spreads the refuse, crushes it flat, covers it uniformly, then "irons down" the dirt cover with Bullclam action to eliminate pest pockets, prevent odor, protect community health!

Putting on an even "cover" with Four-In-One Bullclam action!

yards of refuse daily....

provides instant 4-machine utility dollar-saving duties by the dozen!

NEW.. 2¼ cu. yd. TD-14 Four-In-One

Now, get big *Bullclam* sanitary fill efficiency; big *Skid-Shovel* excavating capacity; big *bulldozer* earthmoving ability; big *clamshell* stock-pile performance—*all in one outfit!* Get four-machine utility for one moderate investment—in the new 2¼-cubic yard International Drott TD-14 Four-In-One. For versatility, it can beat a machinery yard full of limited-duty machines. It's a king-sized tax-saver for any sized city. See it soon!

New TD-14 Four-In-One working as a bulldozer stripping hard-frozen ground.

By owning *one* International Drott Four-In-One Skid-Shovel of the proper size, your city can gain the material-handling usefulness of a fleet of costly, specialized, limited-duty machines. Remember, the Four-In-One is now available in 3 sizes: 1-yard to 2¼-yard bucket capacity. Test the fingertip ease of setting the "machine-selector"—to get your instant choice of *4* multi-purpose machine actions! See your International Drott distributor soon for a Four-In-One demonstration!

International Harvester Company, Chicago 1, Illinois

INTERNATIONAL HARVESTER

INTERNATIONAL® DROTT

a little HTH* goes a long way in sanitizing new water mains

For a slow, steady source of chlorine, nothing can equal HTH Tablets for convenience, effectiveness and economy.

Let's consider convenience first. All you need do is fasten HTH Tablets to the top of the pipe interior with hot tar or a suitable gasket cement. When the pipe is filled with water, density currents will carry available chlorine to all interior surfaces of the pipe section. Since the tablets stay in place and dissolve slowly, the chlorine is not washed to the far end as the main is filled. Thus complete pipe line sanitation is insured.

As for effectiveness—HTH Tablets, with at least 70% available chlorine, kill bacteria, fungus and algae . . . fast.

And for economy—one tablet of HTH will sanitize up to thirty feet of four-inch diameter pipe! To get complete details about the use of HTH Tablets for new water systems, mail the coupon.

*HTH is a registered Trademark for high test hypochlorite

MATHIESON

OLIN MATHIESON CHEMICAL CORPORATION
Industrial Chemicals Division
Baltimore 3, Maryland

Please send complete information on the use of HTH Tablets for sanitizing new water mains.

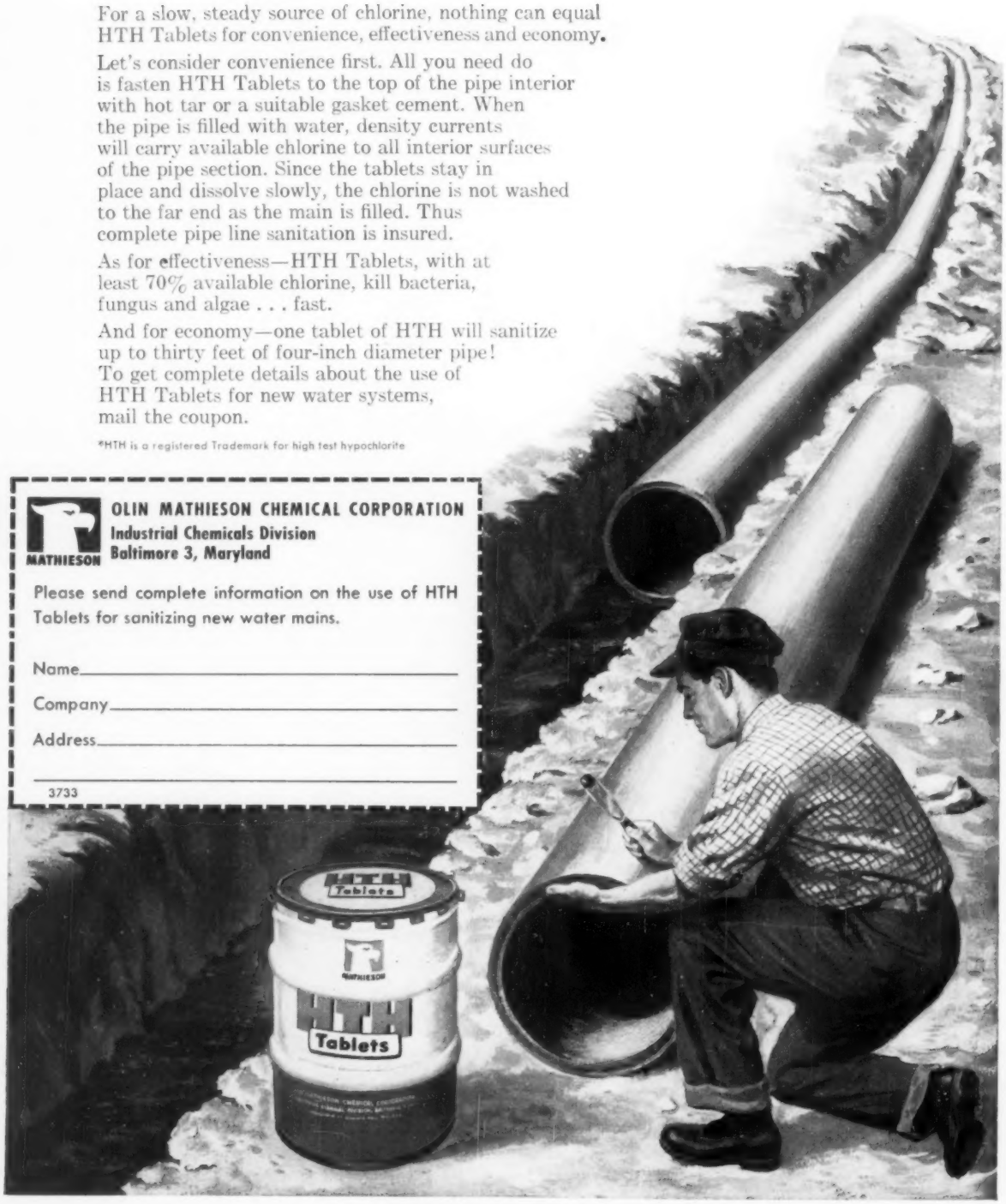
Name_____

Company_____

Address_____

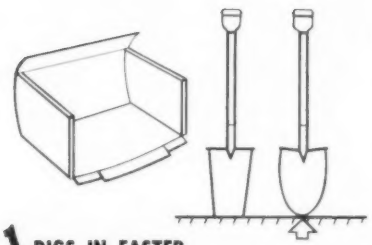
_____

3733



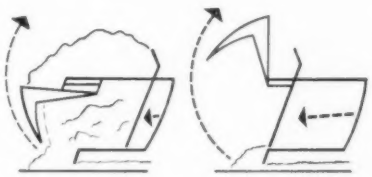
5 BIG REASONS WHY ALLIS-CHALMERS SCRAPERS move more dirt at lower cost

Check over these pull scraper features point by point. See for yourself how performance makes dollars when design makes sense.



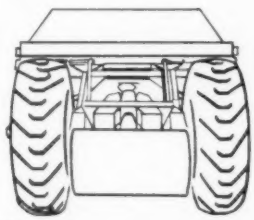
1 DIGS IN FASTER

The penetrating ability of a round-end spade helps illustrate how the curved and offset cutting edge on Allis-Chalmers scrapers concentrates all the tractor horsepower on the center section during initial penetration.



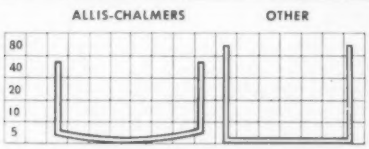
4 POSITIVE EJECTION ASSURES EVEN SPREADING

With patented linkage, apron lifts, then moves forward and up as ejector pushes forward. High apron lift prevents any possibility of material's jamming. Anything that can be put into the bowl can be easily ejected.



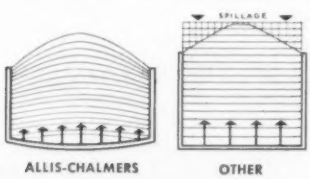
5 HAULS, MANEUVERS EASILY

The extra wide, low bowl keeps center of gravity low, helps the scraper hug the ground for safety. Front running gear has ample clearance at all points. The two-to-three feet shorter wheel base permits easier maneuvering. Scraper can turn in its own length.



2 LESS LOADING RESISTANCE

Low, wide bowl plays an important part in ease of loading. Since loading resistance is largely determined by the height to which the load is built, the lower, wider bowl of an Allis-Chalmers scraper requires less time and power to get the same yardage as other scrapers.



3 HEAPS AUTOMATICALLY

The combination of slightly deeper center cut and correctly angled cutting edge shapes the load as the scraper fills. The greater volume of dirt flowing into the center of the curved bowl "boils" forward, to the rear and to the sides, pulverizing the dirt, filling the voids and producing an automatically heaped load without excessive spillage.

THIS ALLIS-CHALMERS MODEL 315 SCRAPER has a struck capacity of 15 cu yd (20 cu yd heaped) and incorporates all the job-proved advantages found in other Allis-Chalmers scrapers, 4.7 to 20 cu yd heaped capacities.

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

ALLIS-CHALMERS

Trickling Filters
on the
OHIO TURNPIKE
use
TFFI
UNDERDRAINS

At service plaza installations along the great new Ohio Turnpike are eight sewage treatment plants equipped with sixteen 48-foot trickling filters, with TFFI specification vitrified clay underdrains.

Just as the finest engineering went into the Turnpike, the same highest levels of engineering thought arrived at the selection of trickling filters, their equipment and materials.

because

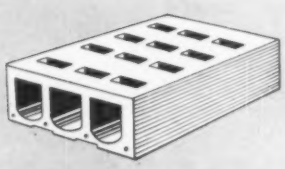
Among the six great advantages of trickling filters are FLEXIBILITY, permitting a wide range of sewage flows without reduction of treatment efficiency.

The sewage at the Turnpike installations has approximately twice normal BOD content and is high in grease and detergents yet trickling filters will give uniformly good results and require little operating attention. Other advantages include low cost, long life, and overloads will present no problems.

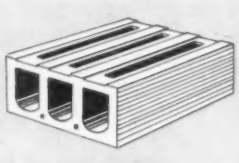
TFFI SPECIFICATIONS

For underdrains are contained in pages 37 and 38 of the new TRICKLING FILTER HANDBOOK, under "Standard Specifications for Vitrified Clay Filter Blocks for Trickling Filters." Available from any TFFI member.

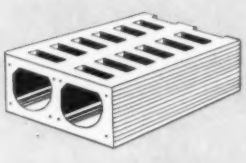
TRICKLING FILTER



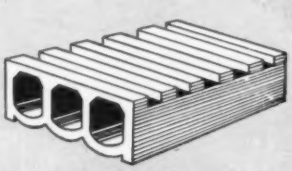
DICKEY
W. S. Dickey Clay Mfg. Co.
902 Walnut St.
Kansas City 6, Mo.



POMONA
Pomona Terra-Cotta Co.
Pomona, N. Car.



ARMCRE
Ayer-McCarel Clay Co., Inc.
Brazil, Ind.



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas.

Now's the time to mail this month's Readers' Service Card.

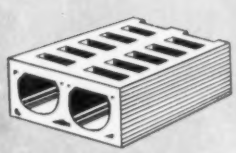
TFFI specification blocks in one of 16 48 foot trickling filters at Ohio Turnpike Service Plaza installations

Designed by Finkbeiner, Pettis & Strout, Toledo 4, Ohio

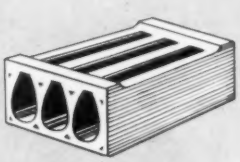
Equipment Comminutors by Chicago Pump Co. and Infilco, Inc. Pumps, Weinman Pump Mfg. Co.; Clarigesters and Rotary Distributors, Dorr-Oliver, Inc.; Chlorinators, Wallace & Tiernan Co. and Fischer & Porter.

Construction by Thompson-Starrett Co., Chicago; Mosser Construction Inc., Fremont, Ohio; Christopher Construction Co., Columbus.

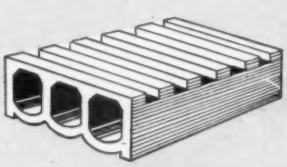
FLOOR INSTITUTE



BOSCO
Bowerston Shale Co.
Bowerston, Ohio



NATCO
Natco Corporation
327 Fifth Ave.
Pittsburgh 22, Pa.

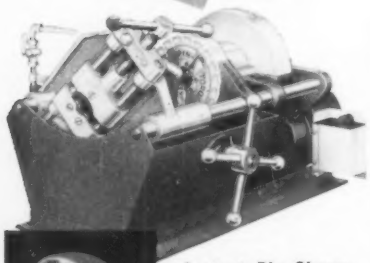


TRANSLOT
Cannelton Sewer Pipe Co.
Cannelton, Ind.

TFFI
Symbol of
good treatment

Get full details of this month's products . . . mail your Readers' Service card today.

TOLEDO
No. 999 Faster Than Ever!



Instant Die Change
Spin Torque Chucking
High Speed Threading

Toledo Spin Torque Chuck
For Faster Production

Quick change features of the TOLEDO No. 999 Pipe Threading Machine have proved real time and money savers on hundreds of jobs. Now . . . with the addition of the Toledo Spin Torque Chuck even faster production is provided. Instant changeover from cutting to threading . . . Spin Torque Chucking–a quick spin and pipe up to 2″ is locked in the chuck–no wrenches, no rocking, socking or hammering. Bench type or portable floor models, full ½ H.P. motor powers heavy gear train drive, finger tip controls. Remember–if it bears the TOLEDO label you know it's a dependable product. See it at your suppliers or write for complete information. The Toledo Pipe Threading Machine Co., 1445 Summit Street, Toledo 4, Ohio.

THE TOLEDO PIPE THREADING MACHINE COMPANY
1445 Summit St. TOLEDO 4, OHIO

BUILDERS OF THE WORLD'S FINEST PIPE TOOLS
TOLEDO
PIPE THREADERS • PIPE WRENCHES • PIPE MACHINES

Washington news

Presented in cooperation with the American Public Works Association and through the courtesy of the Washington Office of the American Municipal Association

Cabinet Committee Report on Water Resources Policy

President Eisenhower, in May, 1954, appointed an Advisory Cabinet Committee on Water Resources Policy, with instructions to submit "recommendations for the strengthening, classification and modernization of water policies, together with a suggested approach to the solution of organizational problems involved." The committee consisted of the Secretary of the Interior, as Chairman, and the Secretaries of Defense and Agriculture as members. In addition, the Departments of Health, Education and Welfare, Commerce and Justice, and the Bureau of the Budget participated on an ad hoc basis. The report of this committee was submitted to the President on December 22, 1955, and was transmitted by him to the Congress on January 17, 1956. Melvin E. Scheidt, public works specialist of the Bureau of the Budget recently explained that this represents the latest step in the direction of achieving a national water policy.

The report, he said, sets forth eight general conclusions which establish the basic principles upon which the Committee's recommendations are based. They are:

"1. The greatest single weakness in the Federal Government's activities in the field of water resources development is the lack of cooperation and coordination of the Federal agencies with each other and with the States and local interests.

"2. There is no single uniform policy, no magical formula relating to water resources which can be applied to all parts of the country at all times and in all places.

"3. It is not practicable, and certainly not desirable, for the Federal Government alone to assume responsibility for the complete development of the Nation's water resources.

"4. The principles of equal contribution for equal benefits received should be applied to the beneficiaries of all Federal water resources developments, although historically programs of Federal agencies have differed widely as to contributions required from beneficiaries.

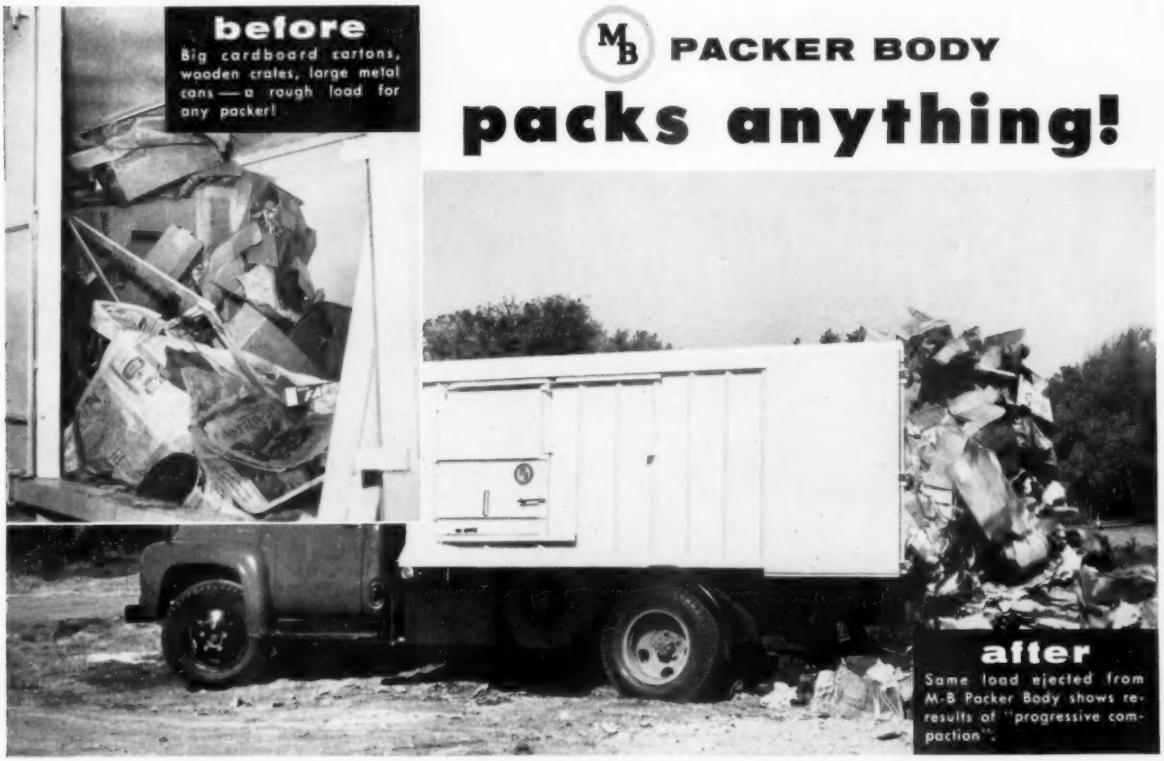
"5. The principles which recognize water rights as property rights should be accepted but a study should be made by the Federal Government in cooperation with State and local bodies to develop principles concerning water rights that would assure the most effective use of water to best meet the needs of the people—national, regional, state, and local.

"6. The States should have primary responsibility for controlling water pollution at its source, but the Federal Government should assist the States through research, investigation, and technical assistance in solving pollution problems, and should participate in the planning of long range programs for the abatement of pollution, in addition to enforcing Federal statutes applicable to the abatement of pollution in interstate waters.

"7. It is generally sound to plan coordinated developments of water resources by large-basin areas, but shifts in population and in economic and industrial growth indicate that in some instances consideration of water resources development should be viewed from the standpoint of a region rather than solely from that of a river basin.

"8. Because international programs and projects cannot always be expected to conform with the same standards and procedures that are proposed for exclusively domestic programs or projects, the report should be considered as generally applicable to exclusively domestic waters only."

Mr. Scheidt also reviewed the principal recommendations of the Committee at a February Conference on the Federal Government and Local Planning which was held in the nation's capital. "It proposed that for river basin planning purposes, water resources committees should be established, as occasion requires, at the regional or river basin level. The membership of these committees would consist of one representative of each Federal department having water resources responsibilities and one representative from each affected State, all


before
Big cardboard cartons, wooden crates, large metal cans — a rough load for any packer!
after
Same load ejected from M-B Packer Body shows results of "progressive compaction".

M-B PACKER BODY packs anything!

no "call-backs"!

With an M-B Packer on the route, every stop counts! No call-backs for bulky, awkward items left behind by ordinary packers. Material too large for the extra-wide side loading doors is carried easily on the spacious, reinforced roof. M-B Packers cover bonus blocks of collection!

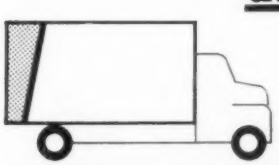
no selective loading!

Collectors don't waste valuable time sorting refuse for vulnerable hydraulic packing mechanisms. M-B Packers take all types of material — cardboard boxes, wet garbage, wooden boxes and crates, large drums, old tires, powdery ashes — anything and everything! The rugged, winch-operated packing plate can stand the roughest punishment.

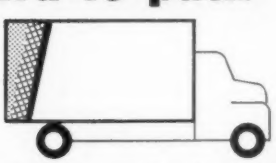
no pre-crushing!

Cardboard, wooden and metal containers are tossed right in the body without pre-crushing. Traveling bulkhead packer plate exerts tremendous crushing force at three points — top and two lower corners — to assure full use of engine power for *complete* compaction.

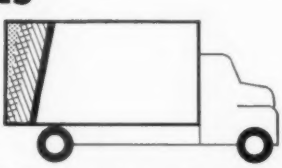
POWERFUL PROGRESSIVE COMPACTION handles <u>all</u> "hard-to-pack" loads



During first packing cycle material is compacted under force of about 1,000 lbs. per sq. ft.



Loadings for second cycle are compacted under same force while first load receives another thorough compaction.



Additional cycles crush new loads with identical potent force — material already compacted is squeezed even more. "Progressive Compaction" means *complete* compaction of the *entire* load.

Ask for a Demonstration! Compare the M-B Packer

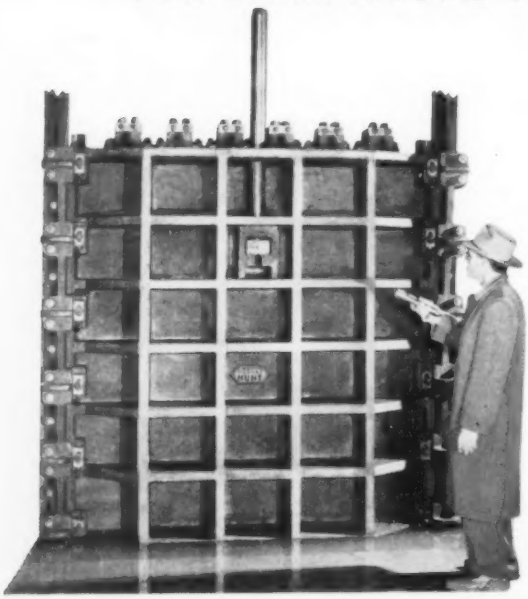
MANUFACTURERS OF QUALITY MUNICIPAL AND CONSTRUCTION EQUIPMENT SINCE 1907

M-B CORPORATION
NEW HOLSTEIN, WIS.

PACKER BODIES LINE MARKERS SWEEPERS PAINTS AND BEADS

Need more facts about advertised products? Mail your Readers' Service card now.

FOR GENERATIONS TO COME!



RODNEY HUNT SLUICE GATES

Controlled cast iron from our own modern foundry ... heavy bronze wedges ... generous bronze wedge seats ... seat facings of malleable extruded bronze, pneumatically impacted and work-hardened in machined dovetail grooves of disc and frame ... these are typical of the workmanship which gives Rodney Hunt Sluice Gates their unique value and true economy for generations to come!

Specify Rodney Hunt Sluice Gates for standard sizes of 6 x 6 to 120 x 120 inches clear opening, rectangular or round. Over 2000 combinations of standard Rodney Hunt Sluice Gates, including many of unusual dimensions, are available with precision-built hoists.

Write us for the name and address of the Rodney Hunt representative in your area. He'll be glad to give you quotation information and engineering assistance.

Atlanta	Houston	Omaha
Boston	Kansas City	Orlando
Charlotte, N. C.	Los Angeles	Philadelphia
Chicago	Memphis	Pittsburgh
Cincinnati	Nashville	Seattle
Denver	New Orleans	St. Paul
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San Juan, Puerto Rico

RODNEY HUNT®

RODNEY HUNT MACHINE CO.
WATER CONTROL EQUIPMENT DIVISION
82 LAKE STREET
ORANGE, MASSACHUSETTS • U. S. A.

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on an equal basis. Each committee would be headed by a permanent, non-voting chairman, appointed by the President. The Committee stated that it did not regard the total number of either Federal or State representatives as material since conflicts should be resolved by cooperation and not by voting strength.

"The Committee recommended that each water resources committee prepare and keep up to date a comprehensive plan which will best serve the region and the Nation in the development of water and related land resources for all purposes. Such plans would be developed cooperatively by Federal, State and Local interests, public and private, and would be divorced from any concept of authorization or responsibility to build. Rather, they would provide the basis for the selection of individual projects to be undertaken by the various individual agencies and non-Federal interests. Each committee would recommend an annual work schedule which would be reflected in the budget of each cooperating agency. The chairman of each committee would be responsible to a Coordinator of Water Resources in the Office of the President, and would have a small independent staff.

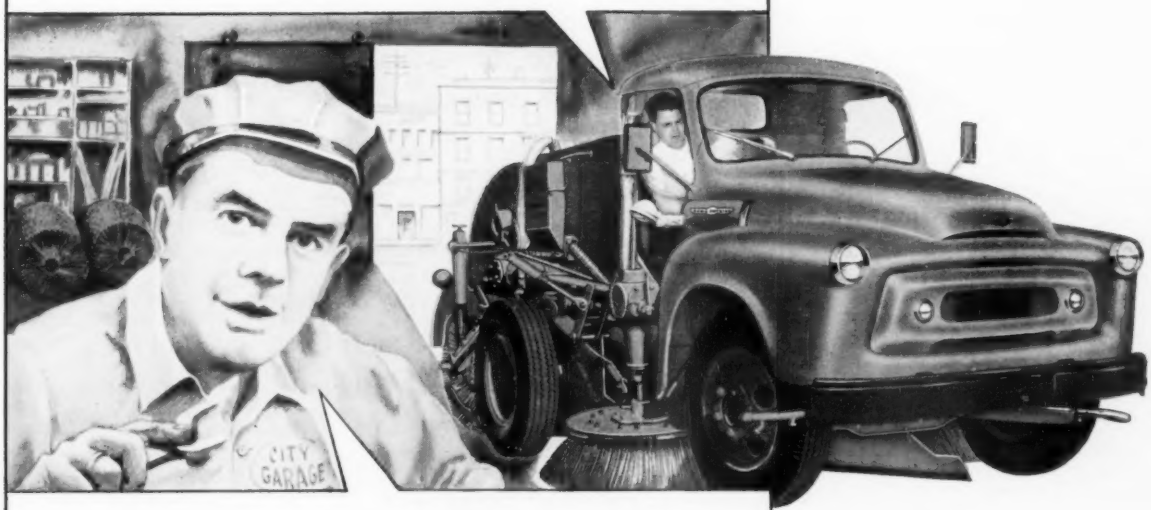
"The Advisory Committee also recommended that an Inter-Agency Committee on Water Resources, composed of the heads of Federal Agencies involved in water resources, and chaired by the Coordinator of Water Resources, be established in Washington to coordinate Federal water resources activities. The coordinator would establish principles, standards and procedures for the use and guidance of the Federal agencies in the planning of programs and projects. A Board of Review, reporting to the Coordinator, would be charged with the review and evaluation of projects proposed by the agencies for construction.

"Next to the recommendation on river basin planning, perhaps the most important proposal of the Committee concerns evaluation of projects. The Committee recommended that project evaluations by all agencies be prepared on a uniform basis, following common standards under the direction of the Coordinator of Water Resources. The Committee stated that because the benefit-cost ratio which is usually used to indicate the economic feasibility of a project does not re-

(*Continued on page* 145)

"We're finally getting
MOBIL SWEEPERS!"

CONVEYCO



Now—we'll get the
SWEEPING PERFORMANCE
—we're paying for..!

Communities across the Nation are buying on proven performance
—That's why they select
MOBIL SWEEPER.
on these **6 BIG POINTS**

- **Unsurpassed Sweeping Ability**
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The proven success of Mobil Sweeper is based on sound engineering design that gives you unsurpassed performance. No need to settle for less. Our large dealer organization in major cities throughout the United States and Canada stands ready to show you how MOBIL SWEEPER does a better job day in and day out at Lower Cost. Write for name of nearest dealer.

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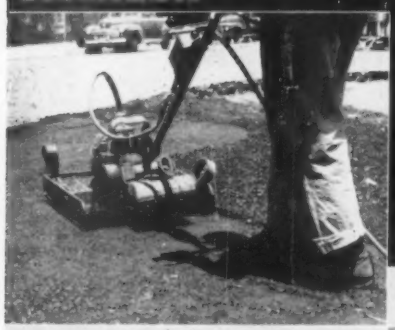
JACKSON VIBRATORY COMPACTORS

TERRIFIC TIME SAVERS ON ALL THESE APPLICATIONS:



BLACKTOP PAVEMENT PATCHING

The manually guided Jackson Vibratory Compactor delivers up to 4200 2-ton blows per minute, is self-propelling and will compact bituminous mixes in 5" layers close to maximum density at the rate of 1800 sq. ft. per hour. Operated from a power plant mounted on an auto trailer with device for quickly picking up and lowering the compactor, this is positively the most advantageous outfit ever offered for patching blacktop pavement, paving drives, walks and similar applications.

It's equally efficient in compacting granular soils in bridge approaches, water, sewer and gas mains and laterals, sub-bases of pavement widening projects, sub-bases of concrete floors, in trenches (interchangeable bases from 12" to 26" available), and dozens of similar applications. 100% of specified density is readily achieved in 10" layers. The Power Plant is fully capable of operating two of these compactors simultaneously and in many instances labor costs can be cut in two by use of the twin-unit shown at right.

For consolidating base courses of rock, slag, gravel and sand in waterbound and penetration macadam construction the Jackson Multiple Compactor is indeed outstanding. It is used on practically all of the important paving jobs in the nation. By all means write for the complete facts.

BACKFILL TAMPING

CAMPACTING IN TRENCHES, ETC.

MACADAM CONSTRUCTION

TWIN UNIT DOUBLES PRODUCTION

JACKSON VIBRATORS, INC.

LUDINGTON, MICH.

AN EQUIPMENT PROGRAM

At the present time I am endeavoring to convince the Mayor and City Council that an equipment replacement program should be installed here in the City of Takoma Park, Maryland. However, I have met with some opposition to the proposal due to a lack of information and some skepticism as to whether or not such a program will work.

Would it be possible for you to send any available information on the subject and perhaps a list of cities throughout the nation that are already operating under such a system? Any aid or assistance would be appreciated beyond measure.

Ward W. Fetrow
Administrative Assistant
Public Works Dept.
Takoma Park, Maryland

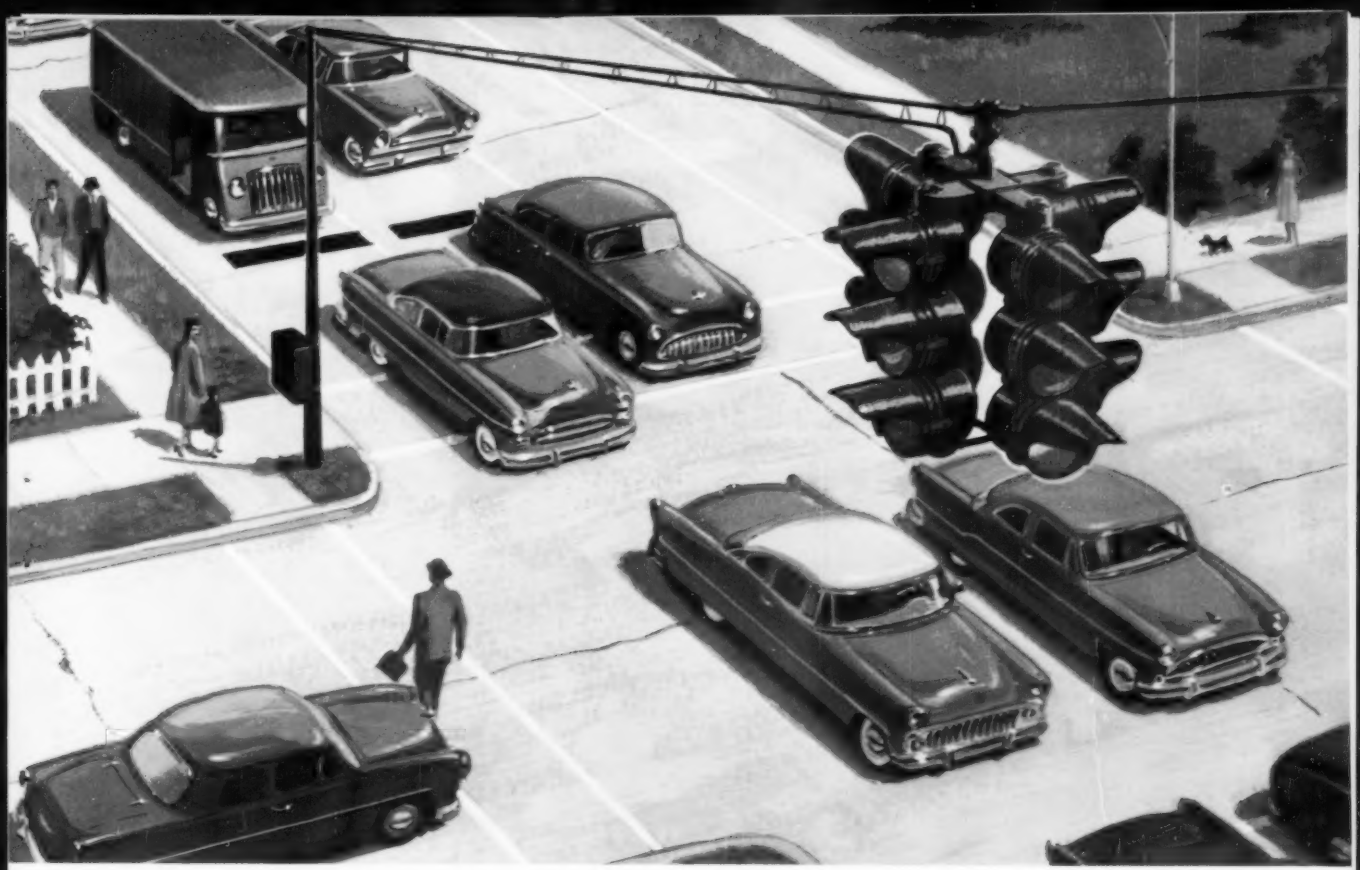
NOTE by Editor: Will those of our readers who have used an equipment program furnish Mr. Fetrow with such information as they have available, sending us a copy?

INFILTRATION & EXFILTRATION

I am writing regarding information on sewer infiltration tests. I had the same problem and obtained some excellent data from E. R. Stowell, Sanitary Engineer, State Department of Public Works, Sacramento, Calif.

Mr. Stowell has developed a test over the years which has been very effective. His test is an exfiltration test. He requires the contractor to do some testing at the start of a project in order to correct poor laying practices which result in failure to meet the test. To quote Mr. Stowell, "Testing of Gravity Sewers—Gravity sewers shall be tested by filling with water to an average elevation of 4 feet above the invert of the sewer or to the top of manholes where less than 4 feet deep.

Now's the time to mail this month's Readers' Service Card.



G-E Type V Vehicle-Actuated Controller

Varies timing to suit traffic— gets more "GO" at main intersections

Signal interval accessories for every need

1. Actuated timer for spasmodic left turns against traffic.
2. Non-actuated timer for consistent left turns.
3. Pedestrian-actuated timer for extending green intervals.
4. Synchronizer to coordinate controller in single-cycle system.
5. Minor movement timer for separate actuated movement.
6. Double-phase, extra-interval timer.
7. Single-phase, extra-interval timer.

No other controller of this type goes beyond detecting a demand on the actuated phase as does the G-E vehicle-actuated Type V. It not only counts cars but also varies timing according to count—and adjusts more effectively to traffic demands as a result.

YET THIS CONTROLLER shares with other G-E units the benefits of easy and fast maintenance gained from its simple, unitized construction and liberal use of convenient jack-mounting. And your traffic-control distributor can easily furnish standard replacement parts without waiting for special units.

IN ELECTRO-MECHANICAL UNITS, G. E.'s vehicle-actuated Type W offers performance superior to any in its field. No other controller of its kind has so few components.

FOR THE FULL STORY on these new controllers, both full- and semi-vehicle-actuated, and accessories, contact your authorized G-E traffic distributor or Apparatus Sales Office, or write Section 453-69, General Electric Company, Schenectady 5, New York.

Progress Is Our Most Important Product

GENERAL ELECTRIC

There's a D-O Unit for Practically Every Step in Every Sewage Treatment Flowsheet

Aerial view of the Ada plant taken in 1954 shortly after starting up. Clariflocculator unit at left. Consulting Engineer: Ralph W. Delaney, Ada, Oklahoma.

DORRCO CLARIFLOCCULATOR

Used in New Ada, Oklahoma, Plant

LOW RATE TRICKLING FLOWSHEET

Typical of many U. S. cities, the problem of a steady growth of population in Ada, Oklahoma, resulted in badly overloaded sewage treatment plant facilities. By the late 1940's, it was apparent that the original plant built in 1939 was completely inadequate to handle the increased flow. Rather than expand existing facilities, studies made by the city indicated that it would be more economical to build an entirely new 3 MGD plant.

In designing the plant, Consulting Engineer Ralph W. Delaney of Ada, Oklahoma, incorporated a 70 ft. dia. Dorrco Clariflocculator mechanism in the flowsheet to handle the flocculation and clarification steps. In addition to this combination unit, equipment at the Ada plant includes a Dorr Detritor unit for grit removal, a 168 ft. dia. Dorrco Distributor for low rate trickling filter treatment, a 75 ft. dia. Dorr Final Clarifier and a Dorr Mult-digestion System.

If you would like more information on Dorr-Oliver equipment and methods for modern sewage treatment, write to Dorr-Oliver Incorporated, Stamford, Conn., for Bulletin No. 6041.

Clariflocculator and Detritor T. M. Reg. U. S. Pat. Off.

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new, improved

PAYLOADER®

tractor-shovel

model HO

2¼ cu. yd. CAPACITY

7,500 lbs. @ 4 mph

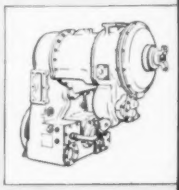
Bigger Capacity–Better Performance

This new 1956 model HO has a bucket capacity of 2¼ cu. yd. payload, 1¾ cu. yd. struck . . . is the biggest capacity "PAYLOADER" ever offered, and outstanding by any measure. Pound for pound, it's way ahead of the field in digging power and carrying capacity. The famed Hough bucket motion has powerful pryout action and 40° tip-back at ground level to *get* big loads and *hold* big loads without spilling.

It has power brakes, power steer and power shift . . . is more maneuverable . . . faster and easier operating and easier riding — with or without a load. It delivers better, more reliable traction over a wider range of ground conditions than any wheeled tractor-shovel *ever* has. It has balanced design and durability *throughout* to deliver big yardage day after day without interruption.

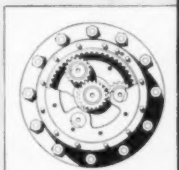
If you want the last word in a big husky tractor-shovel, insist on a model HO. Your "PAYLOADER" Distributor has all the facts.

Complete Power-Shift Transmission



The fastest and easiest-operating transmission ever built. All shifts can be made instantly, on-the-go, under full engine speed. There's no stopping for a RANGE shift, there's no foot clutch. With the forward-reverse control the operator can "creep" the machine at full engine speed, in any gear, while maintaining full bucket action . . . all this plus torque converter drive.

Planetary Final Drives



Rugged planetary final drives in the wheel hubs, plus hypoid differential gearing, keep torque low in axles . . . prolong life of axles and all drive train parts. Torque-proportioning differentials assure effective traction under slipping conditions. If one wheel starts to slip more power is delivered to the opposite wheel.

PAYLOADER®
MANUFACTURED BY
THE FRANK G. HOUGH CO. LIBERTYVILLE, ILL.
SUBSIDIARY—INTERNATIONAL HARVESTER COMPANY

THE FRANK G. HOUGH CO.
761 Sunnyside Ave., Libertyville, Ill.

Send full information on "PAYLOADER" 4-wheel-drive tractor-shovels.

☐ model HO—2¼ cu. yd. ☐ model HH—1½ cu. yd.
☐ model HU—1 cu. yd.

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CITY _____
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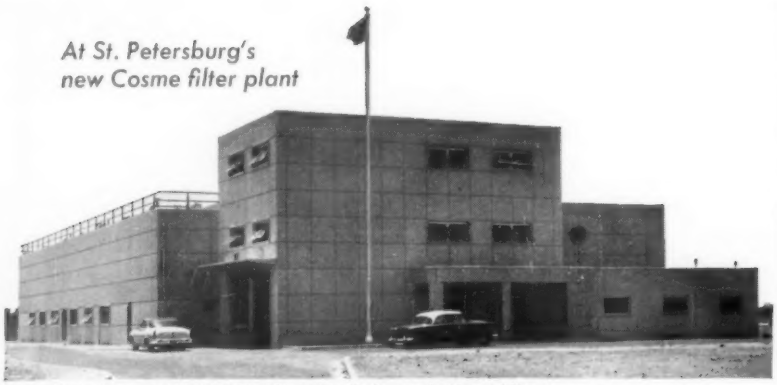
At St. Petersburg's new Cosme filter plant



Cosme Plant: Filter capacity 24 MGD • Consulting Engineers: Greeley and Hansen
Mechanical Contractor: Bass Construction Co.

Simplex provides Centralized automatic filter control!

The St. Petersburg, Florida, water system has just been expanded. In the Cosme plant, the latest addition—a new, master pneumatic control system provides the dependable accuracy that assures *maximum filter efficiency*.

Backbone of the system are tried and proven Simplex "S" Controllers for each filter to keep rate-of-flow constant despite changes in head. From these direct-acting controllers, new Simplex Laminair Converters transmit pneumatic signals instantly. So at the new, sensitive bellows-type Receiving Instruments, there's no hunting, no lag, no inaccuracies!

Results: Rate of flow, loss of head and water levels are indicated and recorded, with total plant flow summated, *at one central table* that operates all filters at optimum rates.

Filter gallery: Diaphragm pots for Master Pneumatic System are just above counterbalanced arms of the Simplex Controllers.

At this one table, Simplex pneumatic receivers give centralized measurement of summated plant output and centralized control of flow.

FREE TECHNICAL INFORMATION!
Write Simplex Valve & Meter Company, Dept. PW-4
7 E. Orange St., Lancaster, Pa.

Accurate instruments and controls for over 50 years

SIMPLEX®
VALVE AND METER COMPANY

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

When we first started these tests we used an allowable leakage not to exceed 750 gallons per inch diameter per 24 hours per mile of sewer. We now specify an allowable leakage not to exceed 300 gallons per inch diameter per 24 hours per mile of sewer. Leakage rates lower than 300 gallons per inch diameter per 24 hours per mile of sewer are obtainable with hot poured joints when joint surfaces are primed and care is used in making joints. Leakage rates lower than 150 gallons per inch diameter per 24 hours per mile of sewer are possible with rubber sleeve mechanical compression type couplings. Measurement of leakage should be made after allowing time for initial absorption of water by pipe and manhole walls."

When testing on a slope a plug may be inserted into the pipe at the lower manhole so that water does not flow from the top of the lower manhole before the upper section is filled. While on steep grades a range of hydrostatic heads is encountered the test on the whole has a great deal of merit. It keeps the contractor "on the ball' and keeps down the amount of ground water reaching the sewage treatment plant.

A. Gordon Wheeler,
Associate Engineer,
Donald E. Stearns,
Consulting Engineer,
Cazenovia, N. Y.

SHORTER HOURS IN WORK WEEK

The February issue of your publication arrived while I was attending a meeting at Ann Arbor, and the editorial on "What Labor's 32-hour Week May Mean to Public Works" wasn't read until yesterday.

What the editorial caused me to notice were some items from yesterday's local newspaper. At Manistique, city employees are asking for their work week to be reduced from 45 to 40 hours. At Detroit, a work week cut to 35 hours for certain city and county employees seems to have been approved.

Evidently, the increased demands for public works will have to be met in less time. So the editorials on "A Positive Program for Getting More of These Much-Needed Engineers" and "Mechanizing Public Works Engineering Procedures" in the same issue of your journal seem quite appropriate.

Russell L. Johnson
Engineer in Charge
Michigan Department of Health
Northern Peninsula Office
Escanaba, Michigan

Note how "Telvar" has kept the guard-rail area free of vegetation. Untreated section at left shows kind of growth involved, growth that causes fire hazards, cuts visibility and often impedes drainage.

FREE ILLUSTRATED BOOKLETS describe how to control weeds and brush with Du Pont chemicals. Write to Du Pont, Grasselli Chemicals Dept., Rm. D-4032, Wilmington, Del. In Canada, Du Pont Company of Canada Limited, 80 Richmond Street West, Toronto, Canada.

Spray just once with Du Pont TELVAR®

WEED KILLERS

When you use "Telvar" weed killers, vegetation is killed through the roots and regrowth is prevented because the chemical remains in the soil . . . provides residual action all season long. And low dosages (1 to 1½ lbs. per 1,000 sq. ft.) make it cost little for the results you obtain. Such low rates also mean less handling, less use of storage facilities.

"Telvar" weed killers come as wettable powders, are non-corrosive, non-flammable, non-volatile, low in toxicity to humans and livestock.

Include "Telvar" weed killers in your weed-control program this year. Prove to yourself how these products of Du Pont research can help cut your maintenance cost to new low levels.

• • •

Where brush is a problem, Du Pont Ammate® X weed and brush killer is the product you need. It kills more kinds of brush with unusual safety. With ordinary precautions, "Ammate" X may be used close to such crops as cotton, tomatoes, soybeans and peanuts.

On all chemicals, follow label instructions and warnings carefully.

DU PONT
REG. U. S. PAT. OFF.

WEED and BRUSH KILLERS

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

FREE EQUIPMENT DATA to Help Your PUBLIC WORKS PROGRAM

NEW LISTINGS

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field.

Data on Incinerator Design Standards

223. This bulletin from Incinerator Institute of America, 420 Lexington Ave., New York 17, N. Y., contains a compilation of data adopted by the members of the Institute as being the best standard design practices in the industry today. This information will serve as a guide to specification writing and installation and the requirements of building departments. Check the reply card.

"Wedge Lock" Plastisol Sewer Pipe Joints

244. The new joint is extremely flexible, resists separation, prevents root penetration and requires no special tools for assembly. It consists of plastic rings securely cast on both the bell and spigot ends of a vitrified clay pipe. For full details write Pacific Clay Products, 1255 W 4th St., Los Angeles 17, Calif., or check the reply card.

Traffic System Computer & Selector

260. Electro-Matic Master Equipment is fully covered in Bulletin E-222 just released by Automatic Signal Div., Eastern Industries, Inc., Norwalk, Conn. This system provides coordinated signal control responsive to traffic changes as they develop and it continually evaluates and adjusts to volume and direction of traffic. Check the reply card.

Pitot Water Leak Detector

301. A comphrehensive and well written 20-page bulletin, No. 1301, of interest to engineers and maintenance personnel of municipalities, public works and water works dealing with water conservation and water wastage, is available from Simplex Valve & Meter Co., Lancaster, Pa. For this valuable data on care of equipment and installation instructions check the handy reply card.

Testing Water Meters

353. This 40-page catalog is a discussion of fundamentals and a guide to sound practice in meter maintenance. It covers standard specifications of meter accuracy, descriptions of the latest developments in meter testing equipment and many drawings and diagrams. For your copy write The Ford Meter Box Co., Inc., Wabash, Indiana, or check the reply card.

Three Steps To Tighter Sewer Joints

349. A 20-page catalog describing the 3 steps to tighter joints to insure against infiltration of ground water into sanitary sewers is available from Presstite Engineering Co., 39th and Chouteau, St. Louis 10, Mo. Primer, Ropax and Kalktite are the 3 materials used in the 3 step set-up. Check the reply card for your information on tighter joints.

Equipment For Highway Stabilization

363. The Roto-Mixer and Preparator are machines available for low-cost road building and stabilization. For operation, uses and specifications get literature from Road Machinery Div., Wm. Bros Boiler & Mfg. Co., Minneapolis 14, Minn., or check the handy reply card.

Sewer Capacity Speedily Restored By "Reboring" Service

24. An attractive brochure offered by National Power Rodding Corp. describes their mobile unit with specially designed power rodding drive and central mechanism that gets on the job fast; rebores clogged sewers and drains cleanly and safely without impeding traffic or disturbing property. Check the reply card or write National Power Rodding Corp., 201 N Wells St., Chicago 44, Ill.

Dust Control Made Easy

30. Details on an effective solution for your dust annoyance problems are presented in a colorful bulletin. "Gulf Sani-Soil-Set—the modern, proven agent for controlling dust." Get your copy to learn how this long-lasting, easily applied material can be of help. Write Gulf Oil Corp., 1822 Gulf Bldg., Pittsburgh 30, Pa. or check the reply card.

Roll-On Joint Pipe For Water, Sewage or Other Liquids

388. American Roll-on Joint Pipe that is centrifugally cast in sand-level molds for water, sewage or other liquids is described completely in catalog just released by American Cast Iron Pipe Co., Birmingham, Alabama. Applications, specifications, design, class, assembly and disassembly are included. Check the reply card.

Black Top Road Maintenance and Construction Equipment

286. A highly informative, 36-page catalog, covering the entire field of highway and road maintenance equipment has been released by Littleford Bros. Inc., East Pearl St., Cincinnati 2, Ohio. Units described and illustrated include distributors, supply tanks, sprayers, brooms, rollers, heater-planer, asphalt kettles and accessory tools. Check the handy reply card for your copy of this valuable catalog

The Principles of Compaction by Vibration

48. Compaction specifications that can't be met with ordinary compactors are no problem to the new Essick vibrating rollers. Complete descriptive literature explaining the principles of compaction by vibration and the Essick vibrating roller is available from Essick Mfg. Co., 1950 Sante Fe Ave., Los Angeles, Calif. Check the handy reply card.

"Water Boy" Portable Water Coolers

432. Descriptive literature is available on portable water coolers and cans with the Sparkleen Liner. Sizes, models and price lists are fully covered in bulletins from Schlueter Mfg. Co., 4616 N. Broadway, St. Louis 7 Mo. Check the handy reply card.

Valuable New Floodlighting Catalog

403. A 16-page catalog containing information on tapered steel and aluminum Monotube floodlighting poles designed for use in lighting outdoor sports activities, commercial and industrial areas and parking lots, has just been issued by The Union Metal Mfg. Co., Canton 5, Ohio. Easy-to-read diagrams, illustrations and applications are included. Check the reply card.

Soil-Cement Laboratory Handbook

405. An 86-page handbook for laboratory and testing engineers is published by the Portland Cement Association, 33 W. Grand Ave., Chicago 10, Ill. It describes soil identification, details of laboratory soil and soil-cement testing and interpretation of test data. The handbook includes charts and tables to simplify laboratory work and describes the latest methods, now in use by the PCA laboratory, which have greatly reduced testing time. Check the reply card.

Cold Asphalt Emulsions For Hot-Mix Pavements

411. A new, 4-page illustrated bulletin that provides detailed information on Laykold asphaltic concrete and Bit-U-Mix paving mixtures for all types of road construction is available from American Bitumuls & Asphalt Co., 200 Bush St., San Francisco, Calif. Check the

Information on Boring Machines

365. General operating instructions for the Earthworm boring machine, a portable compact unit for underground installation of pipe and conduit, are available in new bulletin just released by Lube Jack Co., P. O. Box 1100, Santa Monica, Calif. Suggested procedures for installing pipe or conduit and a price list are included. Check the reply card.

Information on A-C Model D Motor Graders

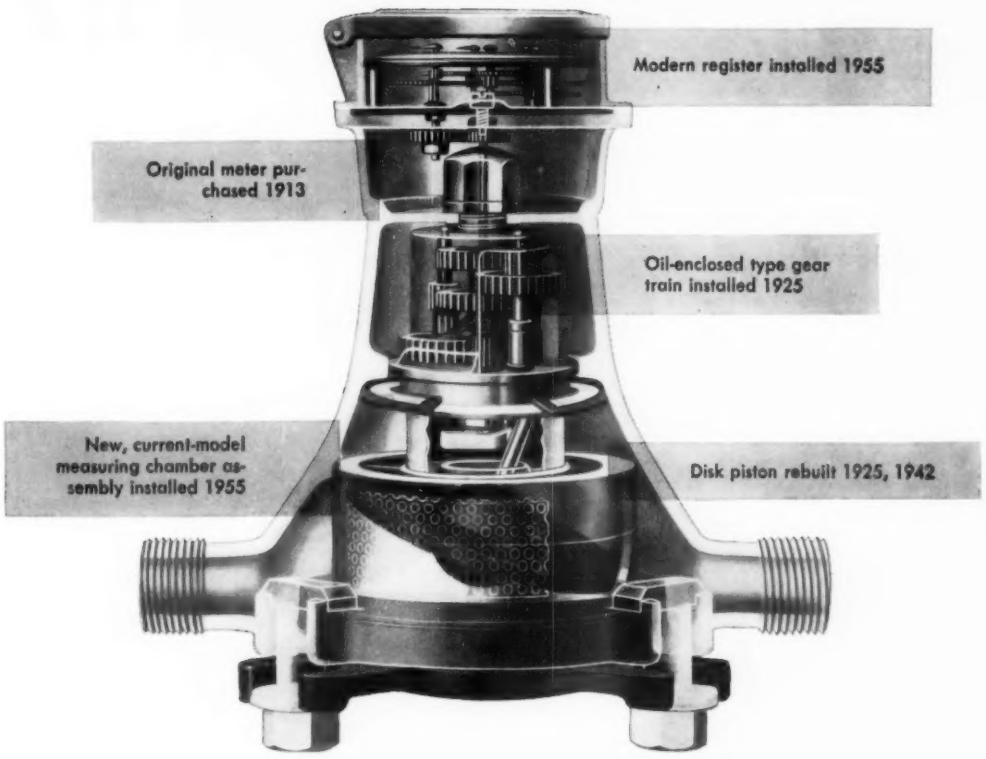
430. The design, engineering, construction and performance story of the Allis-Chalmers 50 hp Model D motor grader is completely told in a 16-page 2-color catalog available from Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wisc. Features, specifications, attachments and accessories are fully covered. Check the reply card.

Literature on Asphalt and Aggregate Spreaders

431. Aggregate and asphalt spreaders are fully described in literature available from Good Roads Machinery Corp., Minerva, Ohio The "Odell" and "Handy" spreaders can be hitched to any standard dump truck and can spread asphalt, gravel, clay, limestone for highway construction and maintenance. For full details check the reply card.

Field Engineer's Catalog

304. A new 32-page catalog that features a wide selection of equipment and supplies for field engineering has just been released by Frederick Post Co., 3666 N. Avondale Ave., Chicago 18. Ill. Transits, levels, range poles and leveling rods and chains are a few of the items described and illustrated. Check the reply card today.


Modern register installed 1955
Original meter purchased 1913
Oil-enclosed type gear train installed 1925
New, current-model measuring chamber assembly installed 1955
Disk piston rebuilt 1925, 1942

How NEW is this Meter?

It was built in 1913 . . . but it's almost as new as 1956. Over the years, working parts have been replaced. Its performance matches every standard of modern metering practice.

The parts used to repair this meter at its last overhaul are identical to those used in the latest Trident meters. They embody every thoroughly tested advancement known to the science of metering.

Designing modern parts to fit "old" meters has been a rigid Neptune policy for over 50 years. It is just one of the extra advantages that make Tridents a better buy . . . both for today and for the years to come.

274

NEPTUNE METER COMPANY
19 West 50th Street, New York 20, N. Y.

NEPTUNE METERS, LTD.
1430 Lakeshore Road, Toronto 14, Ontario

Branch Offices in Principal American and Canadian Cities.

Need more facts about advertised products? Mail your Readers' Service card now.

NEW LISTINGS (Cont.)

Catalogs on Safety Beam and Cable Guard Rail

391. Guard rail for highways, bridges, parking areas, airports and around danger areas of buildings is fully described in catalogs available from Bethlehem Steel Co., Bethlehem, Pa. Standard details, assembly drawings, testing, application and information on guard rail posts are included. Check the handy reply card today.

Helpful Reference Catalog on Waterworks Gate Valves

146. All necessary details on Double Disc Parallel Seat Gate Valves for waterworks use are provided in the attractive 36-page bulletin issued by Ludlow Valve Mfg. Co., Inc., Troy, N. Y. Conveniently arranged design data shows all dimensions for 2" to 60" valves. Gearing, floor stands, operating devices are covered too. Get Bulletin 54W by checking the reply card.

Traffic Paints That Last a Long Time

274. Traffic paints with the Parlon-Pentalyn formula, that has long wear, dries quickly, has excellent adhesion, provides an excellent bond for glass beads and can be applied by flow or spray is described in a bulletin just released by Cellulose Products Dept., Hercules Powder Co., Wilmington 99, Del. Check the reply card today for your copy.

Valuable Concrete Equipment Catalog

420. Concrete vibrators, portable concrete grinders, vibrating screeds, and rotary trowels are fully illustrated in a 16-page catalog available from Stow Mfg. Co., 290 Shear St., Binghampton, N. Y. Complete specifications, sizes and a list of accessories and attachments are covered. Check the reply card.

Literature on Jiffy Joint Clay Pipe

410. An illustrated bulletin describing the new Plastic Jiffy Joint Clay Pipe is available from Cannelton Sewer Pipe Co., Cannelton, Ind. The joint withstands temperature changes and pressure and eliminates the problem of root penetration around the spigot end. For your copy of the bulletin check the reply card.

Catalog on Electrical Equipment

64. A complete catalog on condulets, floodlights, airport lighting equipment, traffic signals, control systems and special lighting equipment is offered by Crouse-Hinds Co., Syracuse 1, N. Y. Check the reply card for your copy.

Automatic Emergency Lights

83. Complete information is available on Big Beam Automatic emergency lights that will plug into any convenient lighting outlet or operate with storage battery and built-in charger. Types, models and prices are covered. Write to U-C Lite Mfg. Co., 1026 W. Hubbard St., Chicago 22, Ill., or check the reply card today.

For Prompt Service Use The Reply Card

Complete Catalog on Pipe Line Equipment

121. Listed under one comprehensive catalog No. 26 are a complete line of water, gas and sewer pipe line equipment. Some of the items covered are pipe cutters, diaphragm pumps, melting furnaces, calking tools, Mscope pipe finders and joint runners. Write to Joseph G. Pollard Co., Inc., New Hyde Park, N. Y., or circle the reply card for your copy.

A New Development in Fluorescent Lighting

130. A catalog on LUXaire (R), a new development in outdoor fluorescent lighting, is offered by Pfaff & Kendall, 84 Foundry St., Newark 5, N. J. The catalog illustrates actual installations, provides engineering information and suggests more than a dozen special applications. Check the reply card.

Davis Back-Hoe and Davis Loader

312. Literature is available from Mid-Western Industries, Inc., 1009 S. West St., Wichita, Kans., describing the new Davis back-hoe and Davis loader. The back-hoe can dig at right angles and to a depth of 13 ft. and detaches in 5 minutes. Both units are available for most popular makes of tractors. Check the handy reply card for more information.

How to Cut Weed Control Costs

308. Information on a weed killer that can save hundreds of man-hours of clearing and cutting is available from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio. Whether you want to control weeds or brush or both, without damage to crops or ornamentals, get this literature today by checking the reply card.

What You Should Know About 6-Wheel Trucks

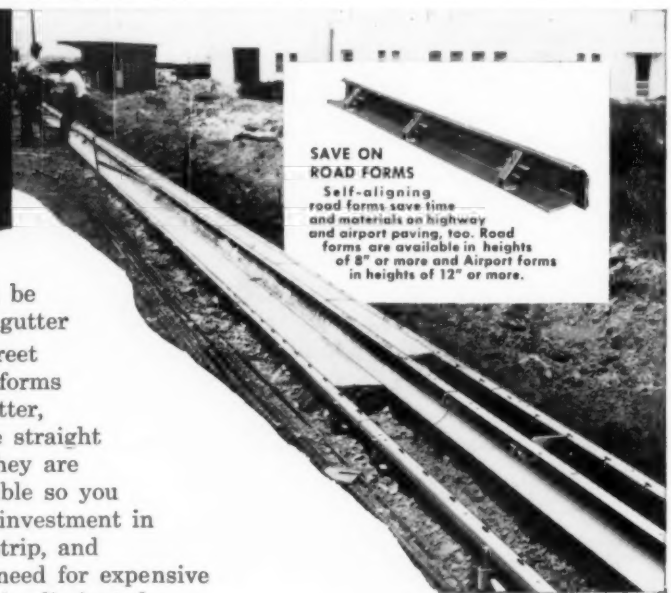
53. Full information on 6-wheel trucks, both conventional and cab-over-engine models, is contained in a new 24-page catalog now available from Motor Truck Div., International Harvester Co., 180 North Michigan Ave., Chicago 1, Ill. Full color and two color treatment are employed throughout the catalog to present design and operating features of the many different lines of trucks. To get your copy of this valuable catalog check the handy reply card today.

WATER WORKS

Elevated Tanks and Other Storage Facilities

32. How engineers' designs and standard AWWA specifications are followed for fabrication and erection of water storage facilities are described in color illustrated booklet. Address the Darby Corp., Kansas City, Kans., or use the handy reply card.

CURB YOUR COSTS
on Curb and Gutter Jobs
with BLAW-KNOX
Street Forms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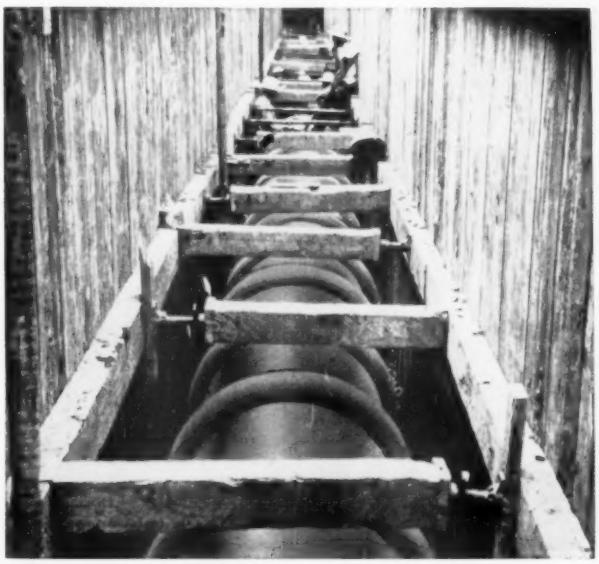
Self-aligning
road forms save time
and materials on highway
and airport paving, too. Road
forms are available in heights
of 8" or more and Airport forms
in heights of 12" or more.

YOU can cut forming costs in half and be set to take on a wide range of curb and gutter jobs with Blaw-Knox "Universal" steel street forms. One "Complete Package" of these forms handles every concrete curb, curb and gutter, integral curb or sidewalk job from simple straight work to curved and serpentine shapes. They are standardized and completely interchangeable so you can do the most work with the smallest investment in forms. They are fast and easy to set or strip, and practically eliminate hand finishing. The need for expensive carpentry and costly single-use materials is eliminated, too. Your Blaw-Knox distributor can give you complete details—see him today.

BLAW-KNOX COMPANY
CONSTRUCTION EQUIPMENT DIVISION
43 Charleston Avenue, Mattoon, Illinois

CLAY PIPE RESISTS CORROSIVE GAS IN ANY CONCENTRATION

THIS VAN NUYS, CALIFORNIA, Clay Pipe installation replaces the original line where the destructive effects of sewer gas proved that only Clay Pipe could handle the job successfully. Nearly 12,000 feet of 30-33-36-39-inch Clay Pipe was installed to replace the previous non-clay line. The job was more costly because sewage from the old line leaked into the new trench.

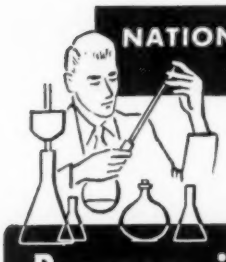


FOR VAN NUYS, CALIF.—City Engineer, Lloyd Aldrich of Los Angeles. CONTRACTORS—Bosko and Bradarich.

Replacement jobs like this prove that you *always* save money by installing Clay Pipe first. It can't be eaten away by any of the acids and chemicals found in residential or industrial wastes. Its cost per year of service is the lowest. And the new jointing techniques developed through Clay Pipe research result in tight, infiltration-proof lines that cut costs at the treatment plant. Why take chances on substitutes? Use Vitrified Clay Pipe . . . and be sure the job is down to stay.

Vitrified CLAY PIPE

CLAY PIPE NEVER WEARS OUT!



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C-356-1

Progress in Public Health - Through Clay Pipe Research

It's a fact . . . our handy Readers' Service card is the way to get new catalogs.

To order these helpful booklets check the reply card inside front cover.

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP-31 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 30 Kw, portable and stationary are described. Write the Kohler Co., Kohler, Wis., or use the reply card.

Water Level Controls for Sewage and Water Plants

31. Dependable float-operated pump and motorized valve controls for single or multiple pump installations are described in bulletins issued by the Water Level Controls Div., Healy-Ruff Co., 719 Hampden Ave., St. Paul 4, Minn. All units feature splash proof construction, mercury tube switches. Check the reply card.

How to Prepare and Maintain Roadways With Calcium Chloride

65. "The Calcium Chloride Road," is the name of a new 24-page two-color catalog issued by the Columbia-Southern Chemical Corp., 632 Fort Duquesne Blvd., Pittsburgh 22, Pa. Included are sections on dust control, gradation, placing and mixing materials and shaping. General information on spring, summer and fall maintenance is also provided. Check the handy reply card.

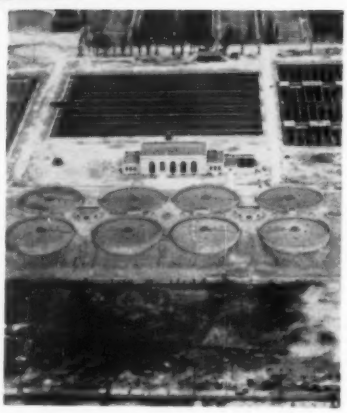
Efficient Coagulation With Ferri-Floc

69. Advantages claimed for Ferri-Floc as a coagulant include wide pH range, quick floc formation, manganese removal control of certain tastes and odors plus other aids in high quality water production. Check reply card for complete Ferri-Floc data. Tennessee Corp., Grant Bldg., Atlanta, Ga.

PRELOAD experience

made yours in tank construction

PRELOAD, after years of experience in doing its own construction work, now expands its activities by granting local licenses to experienced and qualified local contractors, most of whom employ former Preload superintendents.



Preload prestressed concrete digesters at Philadelphia Northeast Sewage Disposal Plant.

You profit in these essentials

Whether we construct your tank directly or through our local licensees, it is still a PRELOAD job, with all which that implies in design, materials, and skill.

- A PRELOAD structure is maintenance-free. Nothing to deteriorate or protect.
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- Over 1,000 PRELOAD tanks now in service are your guarantee of satisfaction.

Technical data and literature on Preload design and construction, available on request.

PRELOAD TRADE MARK

The Preload Company, Inc.
211 EAST 37th STREET
NEW YORK 16, N. Y.

Data on Cutting-In Valves, Repair Sleeves and Accessories

33. A variety of Clow products for installation and repair of cast iron pipe lines, including the Eddy cutting-in valve and sleeve, split sleeves for pipe repair, test plugs, valve boxes. Strickler pipe cutters and other fittings and accessories are featured in literature available from James B. Clow & Sons, Inc., Box 6600-A. Chicago 80, Ill. Check the reply card.

Engineering Information and Water Distribution Products

49. Helpful engineering information, covering water distribution problems, is available from Mueller Company in their W-96 Water Works Catalog. The 328 page catalog features a quick reference sectional indexing arrangement for easy location and identification of the hundreds of water distribution and service products illustrated. Check the reply card and you will receive detailed information on a complete line of water works equipment.

Easily Cleaned, Long Run Filter Bed Media

70. Bulletins on Anthrafilt tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

Propeller Type Meters For Measuring Liquid Flow

107. A twelve-page color bulletin on complete line of Propelollo Meters, a direct-reading, propeller type instrument for metering water and other liquids is now available. General information on description, specifications, types, installation dimensions and operation of meters are included. For your copy of Bulletin 380-K4A write Builders-Providence, Inc., 345 Harris Ave., Providence, R. I., or check the reply card.

Motor Units for Valves, Floorstands and Sluice Gates

82. Complete information on Chapman motor units is available in catalog No. 51 from The Chapman Valve Manufacturing Co., Indian Orchard, Mass. Advantages, installation and operation are fully described. For more details on these units check the reply card today.

What You Should Know About Steel Reservoirs and Standpipes

163. In a handsome 24-page booklet "Horton Steel Reservoirs and Standpipes," the Chicago Bridge & Iron Co., Chicago 4, Ill., shows installations from 50,000-gal. to 10,000-000-gal. capacity with several types of roof and special architectural features. Engineering data includes information on capacities, foundations and improved surface protection. Check the reply card to get your copy.

What You Should Know About Turbine Pumps

167. In a colorful bulletin titled "Water Where You Want It . . . When You Want It" the Johnston Pump Co., Bin "K", Pasadena 8, Calif., gives details on turbine pumps with semi-open or closed impellers; oil or water lubrication; and adaptations for any power source or combination thereof. Get your copy of Bulletin 1015 by checking the reply card.

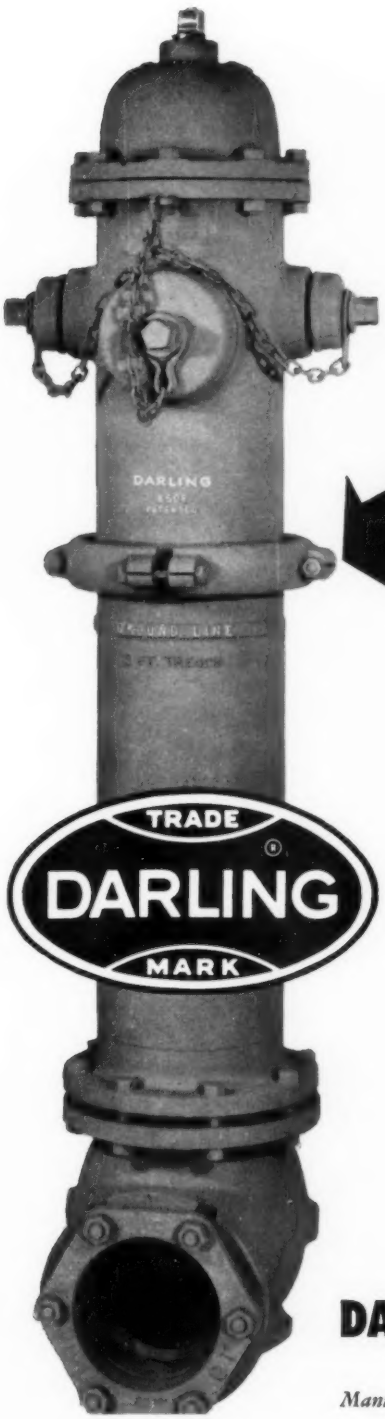
What You Should Know About The Centriline Process

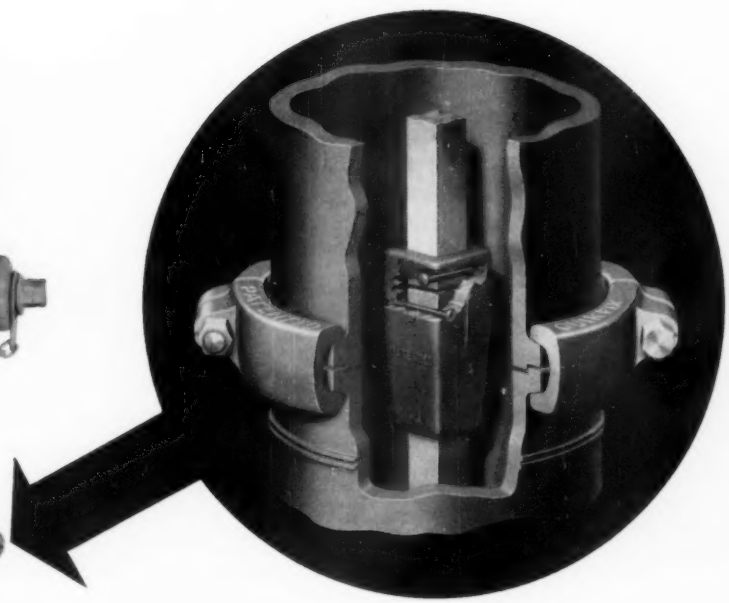
197. The Centriline method for cement mortar lining water mains 16" thru 144" in place to stop leaks, prevent corrosion, increase carrying capacity and decrease pumping costs is fully described in a handsome booklet issued by the Centriline Corp., 140 Cedar St., New York 6, N. Y. Many illustrations and typical case histories show the operation and economies of this process. The Tate process for lining smaller mains is also covered. Check reply card for your copy.

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy. Get yours by checking the reply card.

Take the "sting" out of hydrant damage with DARLING QUIKFIX B-50-B's





HERE'S an unmatched combination for those locations where traffic mishaps are frequent. First, you gain all the unique advantages of Darling's standard B-50-B design, with its ball bearing operation and "O" ring seals. Easier, quicker operation . . . no packing gland maintenance . . . no water seepage to operating threads or bearings . . . no loss of lubricant.

And when destructive impact does occur, Darling's improved breakable barrel and valve rod couplings "take the rap". Both hydrant barrel sections remain undamaged and intact. Moreover, on-the-spot repair is a quick cinch. Note how the barrel coupling is segmented—four pieces —for easiest, minimum part replacement.

Better get *all* the facts about Darling QUIKFIX B-50-B's and see how *much* you can gain and save. Write:

DARLING VALVE & MANUFACTURING CO.

Williamsport 22, Pa.

Manufactured in Canada by The Canada Valve & Hydrant Co., Ltd., Brantford 7, Ont.

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Golden-Anderson has never sacrificed quality just to "close the order." For over 50 years we have been designing and manufacturing valves that give dependable operation . . . that need little maintenance . . . that last a lifetime.

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Modern, leading manufacturer of swimming pool supplies since 1935, makes over 100 top-quality products including filters, fittings, pool paint, vacuum cleaners, algae preventives—everything needed to build and maintain any pool. Modern offers more know-how, greater dependability, more help from an ever-growing staff. Huge stocks and regional warehouses assure fast shipment. Low prices save you money. Good reasons why so many pool owners and operators look to Modern for every pool requirement.

modern SWIMMING POOL CO., INC.

One Holland Avenue, White Plains, N. Y.

New Bulletin Covers Current Darling Line

235. The latest product developments as well as all equipment items produced by Darling Valve & Manufacturing Co., Williamsport, Penna. for water works services are covered in 48-page Bulletin No. 5403. Complete data on ball bearing-operated fire hydrant, including detailed design and operating features, range of types, components, accessories, dimensions and installation and maintenance data are given. Check the reply card today.

Explaining the Water Diaphragm Principle of Chlorinator Operation

243. The features operation and benefits of the water diaphragm principle of chlorinator operation are fully described and illustrated in Publication TA-1026-C-1 of Wallace & Tiernan Inc., Belleville 9, N. J. This helpful publication is yours for merely checking the reply card.

Water Conditioning Data Book Offered To Engineers

259. All engineers and municipal officials concerned with water conditioning will want a copy of the greatly enlarged edition of the popular Permutit Data Book prepared by the Permutit Co., 330 West 42nd St., New York 36, N. Y. This completely revised book presents a compilation of 78 tables, all valuable to the engineer. Subjects include hydraulics, impurities in water, reactions and conversions of chemicals used in water treatment, alkalinity relationships and other helpful material.

Standard Specifications for C. I. Pipe and Fittings

278. Standard dimensions for cast iron water pipe and special castings are available in convenient booklets offered with the compliments of U. S. Pipe and Foundry Co., Birmingham 2, Ala. Get your copy by checking the reply card.

Technical Bulletin on Solenoid Operated Valves

288. Full technical data on application, construction, dimensions and specifications of Golden-Anderson Cushioned solenoid operated valves is contained in Bulletin W-7A, available from Golden-Anderson Valve Specialty Co., 1232 Ridge Ave., Pittsburgh, Pa. Selected valve patterns are offered in ½ to 2-in. and 2½ to 36-in. sizes. Get all the details; just check the reply card.

Engineering Data on Pneumatic Ejectors

327. Advantages of Shone Ejectors with details on receivers, check valves, pilot valves, installation and important operation and maintenance features are fully described in three new catalogs covering mechanically controlled types, electrode controlled units and the Expelsor pneumatic ejector. Write Yeomans Brothers Co., 2000-1 N. Ruby St., Melrose Park, Ill., or check the reply card.

Helpful Data on Water Meters

330. It is to the interest of every water works superintendent and engineer to have full data on dependable Badger water meters and related meter products. Complete data on all types of disc, turbine and compound meters, meter test equipment, yokes, strainers and alarm registers are supplied in an attractive binder by Badger Meter Mfg. Co., Milwaukee 45, Wis. Check the reply card, for your copy.

Points to Consider in Filter Sand Selection

332. Best operation of rapid sand filters requires filter media which is hard, properly shaped, carefully graded and perfectly clean. Filter sand and gravel which meets these exacting requirements is available on short notice from Northern Gravel Company, Box 307, Muscatine, Iowa. Get full details by checking the reply card.

Tips for Installing Orangeburg Pipe

336. Good practice for installation of Orangeburg pipe and fittings is outlined in an illustrated four-page bulletin made available by the Orangeburg Mfg. Co., Inc., 488 Madison Ave., New York 22, N. Y. Trenching and backfilling, pipe laying, cutting and connecting with other types of pipe are included. Use the reply card for your request.

THE P & K OVER-THE-ROAD SIGN SPAN

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FOR THE FIRST TIME IN ALL-ALUMINUM

Two P & K developments that lend *new* flexibility and scope to traffic control planning!

Both P & K units feature more-than-adequate strength against all stresses and strains through exclusive use of P & K originated design and fabricating methods.

Basically one-piece construction means no expensive, time consuming pre-assembly . . . no costly inventories of small parts.

And, P & K All-Aluminum construction means easy installation, corrosion-free, maintenance-free life, plus the clean, attractive appearance that identify all P & K designs.

If these P & K advantages, *and appreciably lower over-all costs*, are of interest to you, write for complete information.

THE NEW P & K CATALOG ON TRAFFIC MASTS AND ARMS IS ON THE PRESS. RESERVE YOUR COPY NOW!

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To order these helpful booklets check the reply card inside front cover.

Valuable Booklet on Porous Diffuser Plates and Tubes

341. A helpful 16-page booklet published by the Norton Co. is a complete guide for the selection of porous media for installation in rapid sand filters and activated sludge plants. Full data are provided for the consulting engineer. Maintenance of porous media is also discussed at some length. Get Form 1246 from Norton Co., Worcester 6, Mass. by checking the reply card.

Modern Filtration of Swimming Pool Water

351. Latest data on filtration systems for swimming pools of 50,000 gallon capacity and over is presented in 24-page bulletin No. 625 by R. P. Adams Co., Inc., 225 East Park Drive, Buffalo 17, N. Y. Design and operating data are provided, together with material to assist you in choosing the right filter for your pool. Check the reply card for your copy of this helpful bulletin.

Dependable Standby Power For Water Pumping

342. The use of LeRoi generator sets for dependable low-cost standby power is discussed in an attractive bulletin, No. G-6, issued by LeRoi Div. Westinghouse Air Brake Co., Milwaukee 14, Wis. Detailed specifications are included. Check the reply card for your copy.

For Prompt Service Use The Reply Card

Helpful Data on Swimming Pools

364. Data on injector nozzles for complete recirculation, fittings for correct drainage and other useful information for pool design are covered in Manual SP issued by Josam Mfg. Co., Michigan City, Ind. Check reply card for your copy.

Valuable Information On Prestressed Concrete Tanks

356. This helpful booklet describes the design, uses and advantages of prestressed concrete in all types of storage tanks. Plenty of charts, diagrams and illustrations are included. Get yours from Preload Enterprises, Inc., 211 East 37th St., New York 16, N. Y., or check the reply card.

All About Centrifugal Pumps

361. Where pumping performance counts you want to check your specifications carefully. Investigate the features of Fairbanks-Morse centrifugals. Use reply card or write to Fairbanks, Morse & Co., Dept. P. W., Chicago 5, Ill.

How to Clean and Develop Water Wells

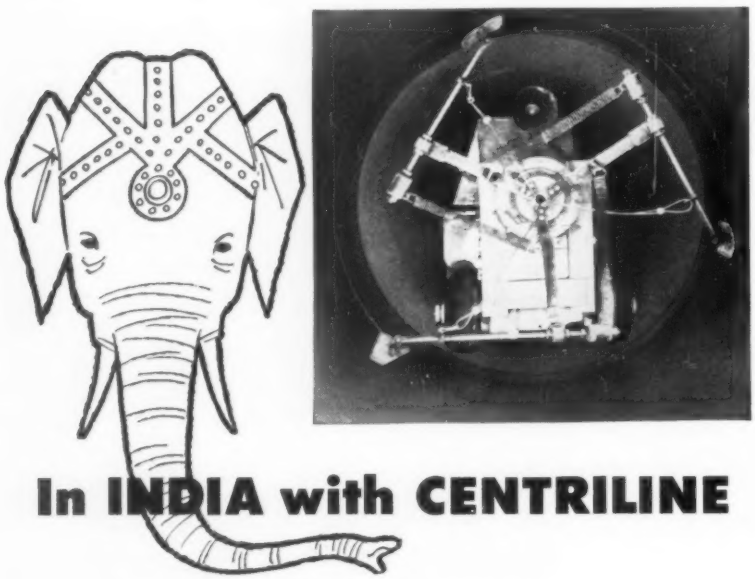
375. The use of Weltone, which combines the cleaning power of Calgon with disinfecting and other chemicals in a safe, highly soluble powder is described in an interesting and informative booklet. For your copy of this descriptive literature write Calgon, Inc., Hagan Bldg., Pittsburgh 30, Pa. or check the reply card.

What You Should Know About Hypochlorination

395. "Hypochlorination of Water" is the name of an informative publication issued by Olin Mathieson Chemical Corp., Industrial Chemicals Div., Baltimore 3, Md. In it there is a discussion of chlorination theory, practice and equipment; control of algae, tastes and odors; and laboratory testing. Check the reply card for this interesting literature.

Important Factors in Water Meter Selection

463. Interchangeability of parts is an important advantage that is yours when you use Trident meters. The newest parts fit your oldest Tridents so you modernize when you repair. Get full data on the entire Trident water meter line by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.



In INDIA with CENTRILINE

On the coast of India, the Burma-Shell Refining Company has used the Centriline process on over 21,000 feet of sea-water cooling pipe. Through Centrilining, a cement-mortar lining is centrifugally sprayed on the pipe walls. Corrosion and tuberculation are eliminated . . . pumping costs are lowered . . . flow is increased . . . maintenance becomes negligible . . . and pipe life is extended indefinitely. This particular project in Bombay called for the Centrilining of 32" I.D. and 36" I.D. new steel pipe with 5/16" lining. But Centrilining works wonders in old pipes as well—with a minimum of surface traffic interruption. Proof of the pudding is in our files—the ever increasing number of repeat contracts from municipalities, industries and contractors. Why not follow their lead. Look to Centriline to rejuvenate *your* water supply systems.

Lummus Company, India, was engineer and constructor on this project. Asiatic Petroleum Corp. was buyer for the owner.

CENTRILINE CORPORATION

A subsidiary of the Raymond Concrete Pile Company

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layout and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute, c/o Editor, Public Works, 200 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

A Handbook of Sewer Cleaning Methods and Materials

44. Complete easy-to-follow directions for every type of sewer cleaning operations and the equipment needed for effective cleaning work is covered in a 48-page booklet issued by Flexible Inc., 3786 Durango, Los Angeles 34, Calif. Full details are provided on power cleaning machines, the SeweRodeR, hand tools and all accessories. Water main and culvert cleaning methods are included. Check the reply card for your copy of this helpful handbook.

Valuable Bulletin on Rodney Hunt Sluice Gate

61. Sluice gate seats on a resilient rubber seal flush with the bottom of the channel and eliminates bottom wedges and the trough in which they descend. Gives design flexibility in water filtration, sewage treatment and sluices, dam, channel and chamber flow control. For complete details write to Rodney Hunt Machine Co., 82 Lake Street, Orange, Mass. for Bulletin 75, or check the reply card.

Engineering Data on Screening Equipment

77. Water, sewage and industrial waste screening equipment is fully described in a 28-page book, No. 2587, offered by Link-Belt Co., Dept. 137, Colmar, Pa. Complete data for the engineer and tables to determine the proper size unit for handling various capacities are included. This valuable, comprehensive booklet may be obtained by checking the reply card.

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UREABOR*

WEED and GRASS KILLER

kills weeds—

prevents regrowth!

One application—DRY—may keep soil bare for 1 or 2 years!

Here's new UREABOR . . . a ready-to-use weed killing compound so powerful that only 1 to 2 lbs. can destroy most types of vegetation in an area of 100 square feet! And control continues effective for long periods because UREABOR *maintains its plant-destroying activity in root zones.* Such low application rates mean greater convenience . . . less storage space for material. You'll say it's great!

Because of its granular form, UREABOR Weed Killer is easily broadcast by hand for spot treatments. Larger areas are more efficiently treated by using a mechanical spreader. For most effective distribution of the small amount of material required, we created an inexpensive, handy spreader especially for UREABOR Weed Killer.

Special Spreader now available...

The PCB Spreader applies UREABOR to best advantage, at prescribed low rates. It holds enough UREABOR to treat 1250 to 2500 sq. ft. without refilling—weighs a mere 6 lbs. Available now for just $10.75 delivered—anywhere in the U.S.A.

LOW RATE OF APPLICATION—
EFFECTIVELY DESTROYS WEEDS AND GRASSES
NOTHING TO MIX—NO WATER TO HAUL
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Helpful Installation Manual For Drainage Structures

62. A 46-page manual, well worth careful study by designers and field engineers dealing with drainage structures, culverts, sewers or conduits, is offered by Armco Drainage & Metal Products, Inc., Middletown, Ohio. Proper location of the structures, base preparation, assembly and backfill are some of the many items covered in detail. Use the handy reply card for free copy.

Helpful Design Data For Sewage Ejectors

81. The application and advantages of pneumatic sewage ejectors are outlined in a new bulletin of the Blackburn Smith Mfg. Co., Inc., Hoboken, N. J. Included are piping diagrams for electrode and float switch controls plus dimensions and layouts for single and duplex systems. Get your copy by checking the reply card.

Theory and Application Of the Flow Tube

84. Hydraulic formulae, head capacity curves and test data for this primary metering element are given in a technical bulletin, "Theory and Application of the Flow Tube," available from Foster Engineering Co., Union, N. J. Check the reply card for a copy.

Mechanical Joint Principle Applied to Sewer Pipe

101. The Amvit joint forms a tight compression seal between bell and spigot rings, prevents infiltration and stops root intrusion. Get data on Amvit jointed vitrified clay pipe from American Vitrified Products Co., Cleveland, Ohio. Check the reply card.

Bulletin on Unitube Tow-Bro Sludge Remover

451. The Unitube Tow-Bro sludge remover is fully described in a bulletin just released by Chain Belt Co., Milwaukee 1, Wisc. Advantages and performances are covered along with different design methods. There are good photographs and sketches of the sludge remover in operation. Check the reply card.

Complete Catalog for Engineers Shows Water and Sewage Plant Equipment

191. The complete line of Jeffrey equipment for treatment of water, sewage and industrial wastes is covered in 52-page Catalog 833-A. Detailed information is provided on bar screens, grinders, grit collectors, "Jigrit" washers, sludge collectors, feeders, conveyors and other related units. Photos and drawings of installations plus capacity tables complete this valuable booklet. Use reply card or write Jeffrey Mfg. Co., 947 N. 4th St., Columbus 16, Ohio.

Digester Capacity Requirements Are Substantially Reduced

284. A 16-page, two-color bulletin, "The Dorrco Densludge Digestion System" is now available from the Dorr-Oliver, Inc., Barry Place, Stamford, Conn. Describes the development, equipment, operation, typical applications and design loadings of this new sludge digestion system. Explains how digester capacity requirements are substantially reduced. Included are wash and line drawings and photographs of the various equipment units. Check the reply card.

Complete Story of Rubber as a Coupling Medium in Pipelines

295. "Joint Enterprise", a booklet describing Tylox rubber joints for coupling pipe used in sewerage, drainage and waterworks projects is now available from Hamilton Kent Manufacturing Co., 427 West Grant St., Kent, Ohio. The booklet also contains illustrated case histories of Tylox-Jointed installations, and suggestions to assist engineers in specifying Tylox joints for both tongue and groove, and bell and spigot pipe. Check the reply card.

Tables Simplify Selection of "Flush Kleen" Sewage Ejectors

386. "Flush Kleen" selection is made easy by a series of engineering tables offered in Bulletin 123 by the Chicago Pump Co., 622 Diversey Pkwy., Chicago 14, Ill. Station types, flow determination, pump capacity and procedures for determining total dynamic discharge heads are outlined in detail. Get this useful reference by checking the reply card.

Get Data Now on This Catch Basin Cleaner

198. Simple powerful pneumatic bucket is featured by Netco Catch Basin Cleaner. Folder 33A gives details and illustrates operation of complete self powered truck mounted unit Netco Div., Clarke-Wilcox Co., 118 Western Ave., Boston 34, Mass. Check the reply card.

Dependable Engines For Sewage Treatment Plants

227. Climax Sewage Gas Engines are available for continuous duty operation to drive pumps, blowers or generators in a range of sizes from 40 to 250 HP. Use the handy reply card to obtain complete details and literature from Climax Engine & Pump Mfg. Co., 208 S. LaSalle St., Chicago 4, Ill.

Get the Facts on The Contact Aeration Process

303. Full engineering details on the submerged contact aeration process of sewage treatment, including diagrams of plant units, area requirements, operating costs and other details are available in a bulletin of the Hays Process Co., Box 768, Waco, Texas. Check the reply card to get the facts.

Design and Applications of the Spiragester

419. The Spiragester is a combination of a clarifier and a digester in a single unit, compactly arranged for economical construction and ease of operation. Full data on operation, explicit design information and specifications are included in Bulletin 135, issued by Lakeside Engineering Corp., 222 West Adams, Chicago, Ill. Check the reply card for a copy.

Helpful Engineering Data on Cast Iron Pipe

422. Complete data on McWane Super-DeLavaud centrifugally cast pipe with bell and spigot or mechanical joints is contained in Bulletin WP-54, issued by McWane Cast Iron Pipe Co., Birmingham 2, Ala. Size range includes 2" through 12" diameters, 18 feet long. Check the reply card.

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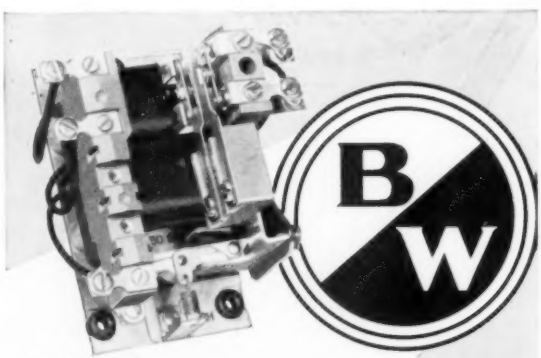

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2224 East Maple Road, Birmingham, Michigan

BEFORE: Condition of pavement on Broad Street prior to treatment.

AFTER: Treated pavement after being open to traffic for one month.

A Tough Job: Seal main street without traffic tie-up

Here's how it was done with BITUMULS® in Richmond, Virginia

BROAD STREET, the main artery in Richmond, Virginia, carries the combined truck and automobile traffic of Routes 1, 301, 250 and 33.

Under a load of more than 40,000 vehicles per day, sections of the existing pavement were raveling at an alarming rate. Full width plant-mix resurfacing would have put the surface too high on the curb line. Digging out the old pavement would prove too costly.

The problem was reduced to this: ***seal the street without traffic tie-up, and without bleeding, flying stone, or other inconveniences to the public.***

Based on many years' experience with Bitumuls, the City Maintenance Forces, headed by H. F. Phillips, Chief, and Dick Kelley, Superintendent, worked out their problem with E. P. Asbury, of the City Construction Department.

The job was put in the hands of W. M. Allnutt, Chief, Construction Division, and Col. A. P. Fulton. Cutting and patch work was let under contract to a local firm, with traffic carried through and around the work.

Sealing was done by the City Maintenance Crew in the following manner:

Early on Sunday, between 6:00 a. m. and 11:00 a. m., 9,000 gallons of Bitumuls (quick-setting emulsified asphalt) was applied on the south side of the street at the rate of 0.3 gal. per sq. yd. This was covered by 15 lbs. per sq. yd. of No. 7 Maryland slag.

Controlled application of Bitumuls asphalt emulsion was followed by the placement of cover aggregate. The surface was then rolled.

Traffic was diverted to the north side of the street, but the south side was opened to traffic at 1:00 p. m. The north side of the street was done in a similar manner early on a week-day morning of the following week.

The results: excellent! Along the entire 1.57 miles of 72.4 ft. roadway there was no softening or bleeding of the fresh seal. No pick-up was experienced, even at open intersections. All work was broomed clean and watered, if necessary, the following day to eliminate dust. Costs were remarkably low.

This is just one of the ways in which Bitumuls has helped to solve pavement problems for cities and towns throughout the country. *When you have a "tough job," contact our nearest office.*

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200 BUSH STREET, SAN FRANCISCO 20, CALIFORNIA • Perth Amboy, N.J. • Baltimore 3, Md.
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Inglewood, Calif. • Oakland 1, Calif. • San Juan 23, P.R.

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A Pressure Proven Joint for Concrete Pipe

335. Investigate the Amseal Joint on low pressure concrete pipe for intercepting sewers, inverted syphons, sewage force mains and low pressure water supply lines. This folder is published by American-Marietta Company, Concrete Products Division, 101 East Ontario St., Chicago 11, Illinois. Describes concrete pipe for use in sewer and water lines where maximum operating pressure will not exceed 50 psi. Check the reply card today.

Combat Unpleasant Odors At Municipal Sanitation Sites

404. Malodors at municipal refuse disposal sites, waste treatment plants and incinerators may be effectively "neutralized" by the odor masking products of Rhodia, Inc. Be sure to investigate this means of eliminating complaints from unpleasant odors. Write Rhodia, Inc., 60 East 56th St., New York 17, N. Y. or check the reply card.

What You Should Know About the Rubber Waterstop

448. A bulletin on the Servicised rubber waterstop has been released by Servicised Products Corp., 6051 West 65th St., Chicago 38, Ill. General information, engineering service, advantages of specifying the waterstop, specifications, general and detail requirements, installation and typical applications, standard sizes and types are fully covered. Check the reply card for your copy.

CIVIL DEFENSE

Get the Facts on Air Raid Sirens

86. There's more to be considered in air raid warning sirens than the loudness of the signal. Get complete information on efficient size and spacing of sirens from Federal Sign and Signal Corp., 8733 So. State St., Chicago, Ill., by using the reply card.

STREETS AND HIGHWAYS

Get Full Data On Aggregate Spreaders

34. Accurate control for spreading asphalt, crushed rock, chips, sand or ice control materials is featured by Highway Equipment Co. materials spreaders. Data on towed, truck mounted and tailgate types available by checking the reply card. Highway Equipment Co., 630 D. Ave., Cedar Rapids, Iowa.

What's Your Digging Problem? Repair Work? Trenches? Footings?

35. At today's prices, hand digging means the job will be costly. You can dig through asphalt and macadam, work fast and efficiently even in cramped areas with the tractor mounted Sherman Power Digger. From one position you can reach to dig 14 feet behind tractor in 140° arc and dig to a depth of 10 feet. For full details check the reply card. Sherman Products, Inc., Royal Oak, Mich.

1,001 Profitable Uses For Holmes-Owen Loader

39. The addition of a Holmes-Owen Loader to your dump truck converts it into a complete digging and loading unit that enables one man to load, haul and dump. Illustrated folder shows how this self-loading unit with hydraulic crowding action can be a real time and labor saver for the municipality or contractor. Check the handy reply card for full data. Ernest Holmes Co., Chattanooga, Tenn.

Easy Reference on Durable Gratings and Treads

90. An easy-to-use catalog containing illustrations, descriptions and complete engineering data on grating-flooring, treads and floor armoring of riveted, press-locked and welded types has been published by Irving Subway Grating Co., Inc., 50-53—27th St., Long Island City, N. Y. To get this useful reference write to the manufacturer and ask for Catalog F400 or check the handy reply card.

Streamlined Data on Tractors, Scrapers and Power Units

102. The complete line of International Industrial Power products, 73 in all, is described in a new 48-page catalog published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. Technical data has been streamlined, yet provides abundant descriptive material on each piece of equipment. Check the reply card for the latest on crawler and wheel tractors, scrapers, dozers and related attachments plus International Diesel, gasoline and gas power units.

How to Save Time on Curb and Gutter Work

143. Every type of curb and gutter work is illustrated in the 12-page Heltzel catalog on steel forms for building concrete curbs, gutters and sidewalks. Time-saving setups show how to speed up the job and save money. Get your copy from Heltzel Steel Form & Iron Co., Dept. PW, Warren, Ohio. Use the reply card to get your copy.

How the "Payloader" Helps Public Officials

190. An attractive booklet "Getting More for the Tax Dollar with Payloaders" makes worthwhile reading for every public official in charge of construction and maintenance of roads, streets, and utilities You will find illustrations and data showing dozens of ways the "Payloader" is used by cities, counties and states, plus convenient specifications on seven models. Check the reply card or write Frank G. Hough Co., 761 Seventh St., Libertyville, Ill.

Trenching Equipment Data Conveniently Assembled

212. The entire line of Cleveland trenching and backfilling equipment is now covered in a single bulletin, with material arranged for quick comparison of capacities, specifications and dimensions of all models. Twenty-four action photos graphically illustrate various job applications. Get Bulletin S-120 now for easy review of your trenching equipment needs. Just check the reply card or write to the Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio.

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Double-Line Marking
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Automotive-Type Steering

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mark more lines per hour at lower cost

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Three-Line 2-Colors
30 to 90 Gallon Capacity
One-Man Operation

Easy Maintenance
Speeds To 10 MPH
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PACKER BODIES • LINE MARKERS • SWEEPERS • PAINTS AND BEADS
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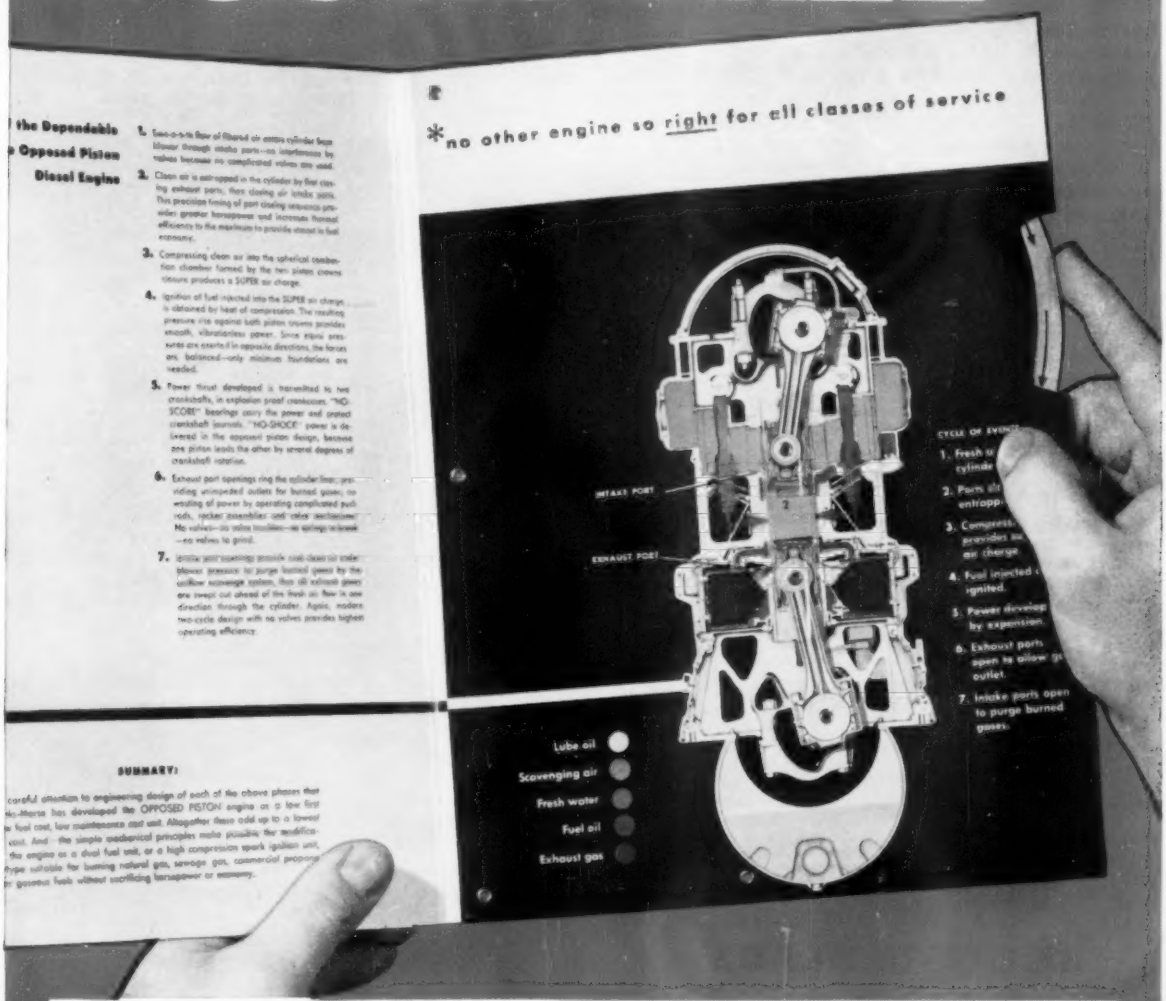
M-B CORP. New Holstein, Wis.

"Working Model" of the Opposed-Piston Diesel

YOURS FREE



Here in Graphic Full Color is a detailed working model of the Fairbanks-Morse Opposed-Piston Diesel Engine—and it's yours free for the asking.

With the 8-inch operating cutaway in front of you, you can follow the complete operating cycle of this outstandingly successful heavy-duty engine designed for continuous service. Moving the disc at the right operates the model showing exact position of pistons, and color codes condition in the cylinder, throughout the entire cycle of events.

You'll also see the simplicity of the O-P that has no valves, intricate valve trains, cylinder heads and gaskets—in fact, it has 40% fewer moving—wearing—parts than any comparable engine of equal horsepower.

If you are interested in dependable power with low operating and maintenance cost, send for your working model of the O-P diesel today! Simply attach this advertisement to your letterhead (or ask for O-P "Working Model") and send to Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago 5, Illinois.

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DIESEL AND DUAL FUEL ENGINES • DIESEL LOCOMOTIVES
RAIL CARS • ELECTRICAL MACHINERY • PUMPS • SCALES
HOME WATER SERVICE EQUIPMENT • MOWERS • MAGNETOS

To order these helpful booklets check the reply card inside front cover.

Finest Line of Markers for Fine Line Marking

165. Complete information on truck mounted highway markers, self-propelled line markers, all purpose line markers, and hand-propelled line markers is available from the M-B Corporation, New Holstein, Wis. Photographs and specifications of each type of line marker are included. For more, check the handy reply card.

Choosing Trucks For Municipal Service

204. Trucks that are high in efficiency and economy are needed for all municipal services. Be sure to investigate latest models of White motor trucks, engineered for high performance under all conditions. Full details from White Motor Co., Cleveland 1, Ohio. Check the reply card today.

Complete Information on Wain-Roy Back Hoe

459. Complete information on a self-contained back hoe that is designed to fit Payloader tractor-shovels and International crawler tractors is available from Wain-Roy Corp., Dept. C, Hubbardston, Mass. Included are specifications, types and many exclusive features. Check the reply card today.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literature from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Literature Available on Wagner Tractor Equipment

464. Information on the Wagner back hoe and loader is available from Wagner Iron Works, Dept. 129, 1905 South First St., Milwaukee 1, Wisc. Specifications, types, models and other valuable data are included. For your copy check the reply card.

The Modern Approach to the Brush Problem

222. Eliminate your brush disposal problem by using an Asplundh Chipper. For complete information on what the Chipper can do, how it can save on costs, various types available and other outstanding features write to Asplundh Chipper Co., 505 York Road, Jenkintown, Pa., or check the reply card.

Comprehensive Data on Bulldozers

232. Hydraulic bullgrader and bulldozer blades for International crawler tractors are described in a 24-page catalog published by International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. All features are fully described, complete specifications are included and many illustrations show on-the-job operations. Check the reply card for your copy.

For Prompt Service Use The Reply Card Inside Front Cover

Getting Specified Density In Granular Bases and Fills

188. Vibratory compactors offer the means for getting specified density in rock, slag, soil-bound macadam, gravel and sand base courses. Just one pass may suffice. Get complete information from Jackson Vibrators, Inc., Ludington, Mich. See how adaptable compactor units handle a variety of compaction needs. Check the reply card today.

Valuable Information On Aerial Surveys

437. What you should know about aerial surveys is described in detail in the latest literature just released by Alster and Associates. 6135 Kansas Ave., Northeast, Washington 11, D. C. Topographic maps, mosaics and planimetric maps by aerial photograph are fully illustrated. For more information check the reply card.

How to Solve the Brush Disposal Problem

277. Fitchburg Chippers, engineered to solve the brush disposal problem reduce troublesome brush and trimmings to tiny, easy to-dispose-of chips. Several models are available to meet your needs. May be mounted on truck body or on trailer, tractor or jeep. Full details in interesting, profusely illustrated 16 page bulletin. Write Fitchburg Engineering Corp., Fitchburg, Mass., or check the reply card for your copy.

How the Mobil-Sweeper Can Improve Street Sweeping

305. Sweeping costs can be cut with the Mobil-Sweeper which features safe highway speeds up to 55 mph, carries 2 2/3 cu. yd. dirt hopper, sweeps swath up to 10' wide with full floating brooms. Hills and deep gutters are no obstacle. Write to the Conveyor Co., 3260 E. Slauson Ave., Los Angeles 58, Calif. or use reply card for complete details on this machine.

Economical Scraper Handles Many Heavy Jobs

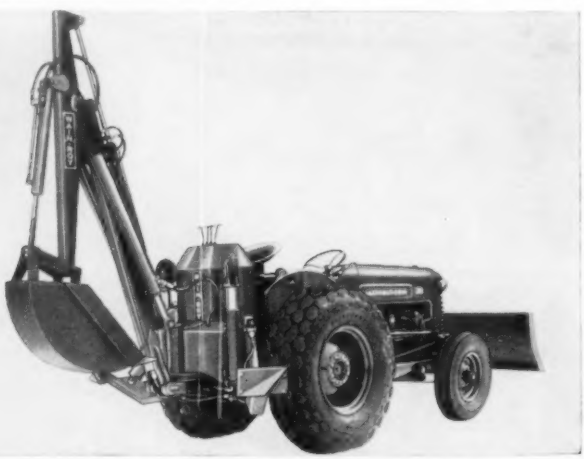
398. Among the many applications of the versatile Model D Tournapull are: grading and building roads; handling garbage disposal; and grading, leveling and terracing. For details on how its speed, power and ability to work either as a self-loading tool can help your production and lower your costs, write Le Tourneau-Westinghouse Co., Peoria, Ill., or check the reply card.

Self-Propelled Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide an ddown to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Full data on these ditchers available by checking the reply card.

new

Wain-Roy BACK HOE and BACKFILL BLADE for I-H Model 300



Here is a low cost, handy, versatile unit that will handle an amazing number of deep, tough trenching jobs, plus backfilling, levelling, grading, etc.

Completely hydraulic, hoe digs and dumps in 190° radius, enabling it to work in close, cramped quarters. Actuating bucket and ample reach downward permits digging vertical bell holes as small as 18" x 42" or as large as desired. Moves fast from job to job, works on paved surfaces.

Backfill blade is exceptionally rugged, completely hydraulic, with down pressure for better penetration. Get complete details from your I-H Industrial Distributor or write direct.

BACK HOE

- Digging Depth 11'
- Bucket Sizes 14"-36" up to ¼ yd.
- Loading Height—7'-8"
- Tremendous crowd—High Speed Retract

BACKFILL BLADE

(Tire Front 7:50 x 16 Rear 14:00 x 24)

- Angles right or left
- Raises 18" Hydraulically
- Blade length 72"
- Full down pressure or float
- Drop Below Ground Level 8"

Wain-Roy CORPORATION Hubbardston, Mass. **Dept. C**

Today's water Supply-

is your community's most valuable asset!

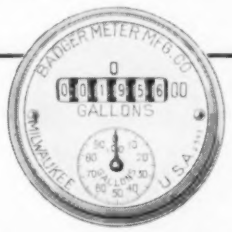
Badger Meters provide a precise check on usage and waste . . . first logical step towards conservation.

This perplexed citizen is a victim of water shortage — fast becoming a major problem in many communities. The tools he holds in his hands hardly equip him to fight for his rightful share — *he needs help from his water department.*

What YOU do *now* to safeguard *present water* supplies — to prevent situations like this —may play an important part in future development of your own community.

Metering all water for residential and industrial use is the first logical step towards knowing *where* and *how much* water is used—or wasted. Studies prove that water use in metered cities is reduced by as much as 33%.

Metering your water supply is a step made easy by the Badger Meter representative in your area. He can furnish complete data on many types of Badger Meters best suited for the specific needs of your community. For an appointment, at your convenience, write direct.



Fair rates for all users - greater income per year

One of the greatest "business machines" works for you — accurately and sensitively registering all flow. Large and small users alike pay fair shares to help keep water departments self-supporting.

Durability, dependability and low maintenance costs make community ownership of Badger Meters an investment in economy that pays dividends over the years.

Badger Water Meters

Water is Vital

"Badger Meters have conserved it for 50 years"

BADGER METER MFG. CO. • MILWAUKEE 45, WISCONSIN

Use Northern Gravel for Rapid Sand Filter

The new Northeast Station in the City of Detroit, which is scheduled for completion in the spring of 1956, is one of the major projects included in the water department's expansion program. The Northern Gravel Company furnished 120 carloads of filtering materials for the 48 rapid sand filters incorporated in this plant.

Filter Sand Specifications

are carefully laid out. The Effective Sizes and Uniformity Coefficients used by Consulting Engineers and also recommended by the American Water Works Association are the result of long years of research and experience.

The Northern Gravel Company is equipped to give you prompt shipment whether it be one bag or many carloads, exact to specifications. Filter sand can be furnished with any effective size between 0.35 MM and 1.20 MM.

Chemical Quality

of the filter sand is also important. It must be hard, not smooth, and free of soluble particles. This requires perfect washing and grading facilities. We have every modern device for washing, drying, screening and testing.

Filter Gravel

supporting the Filter Sand Bed must be, in turn, properly graded to sizes calculated to support the Filter Sand, and be relatively hard, round and resistant to solution.

Northern Gravel has no equal in facilities and our reserves of both sand and gravel are inexhaustible. Northern Gravel Company has been in business over 40 years. We guarantee uniformity of products and our records enable us to duplicate your requirements on short notice. Our location is central and we have commodity rates in every direction.

Northern Gravel Company

Muscatine, Iowa

Box 307 Ph.: Amherst 3-2711

CONSTRUCTION EQUIPMENT AND MATERIALS

Electric Power
Wherever You Need It

75. Electric power for every job—for construction, maintenance and emergencies—is always available for the owner of a convenient Homelite carryable generator. These compact gasoline engine operated units are made in a variety of sizes to suit every power requirement. Get full details by writing Homelite Corp., Port Chester, N. Y., or check the reply card.

Check List for Successful
Earthmoving Bids

147. Valuable information for the earthmoving contractor and for the engineer who must estimate earthmoving costs is provided in a new two-color illustrated booklet issued by Caterpillar Tractor Co., Peoria, Ill. A convenient check list is included to help select the proper equipment for the job. Check the reply card to get Form No. DE502.

Now Every Municipality
Can Own a Trencher

173. The low cost of the Blackhawk Trench Hog, a tractor-mounted ladder type trencher makes it profitable for many municipalities to own their own trencher. Be sure to investigate this versatile machine which digs trenches to 8 feet deep, 20 inches wide. Illustrated bulletin available from Arps Corp., New Holstein, Wis. Just check the reply card.

How to Select Paints
For Every Maintenance Need

467. Selecting the right paint for each maintenance need involves consideration of the service to be rendered, conditions of their use and abuse, and the surfaces to which they are to be applied. To help you determine what to use on various surfaces, an industrial paint index printed in the form of a handy file folder has been prepared by the Tropical Paint and Oil Co., Cleveland 2, Ohio. Get a copy by checking the reply card.

How To Build Stabilized
Heavy Traffic Pavements

233. A 16-page booklet published by Seaman-Andwall Corp., Milwaukee, Wis., shows how low cost, local materials may be utilized in the construction of heavy duty pavements. Many illustrations and well-written text give full instructions on materials and construction methods for subgrades, subbases and base courses. A worth-while booklet for every highway engineer. Check reply card for copy.

Complete Protection
Of Iron and Steel Products

242. What are the advantages of Hot-Dip Galvanizing? Why does it offer complete protection at such an economical cost? You'll find the answers in the attractive booklet "Stop Rust", which gives you the full story of the process plus a comprehensive coating comparison chart. Get your copy promptly by checking the reply card or write American Hot-Dip Galvanizers Assn., Inc., 1st National Bank Bldg., Pittsburgh 22, Pa.

Information on "Bondactors"
Concrete Gunning Machines

282. The "Bondactors" are concrete gunning machines that are capable of gunning cementitious aggregates by means of compressed air at a greater density, stronger bond and longer-lasting surface. Full details on models, specifications, accessories and extra accessories are included. Examples of these machines being used for waterproofing, concrete restoration, stuccoing, building cleaning and fireproofing are shown. For your literature send to Air Placement Equipment Co., 1009 W. 24th St., Kansas City 8, Mo., or check the handy reply card.

Use of Patch Material
On All Maintenance Jobs

297. With the Barber-Greene Mixall you can get hot patch material wherever and whenever you need it for all maintenance jobs. Send for new 8-page bulletin that gives full information on this small, highly portable unit that turns out all types of bituminous patch material in any quantity you need. Write Barber-Greene Co., Aurora, Ill, or use the reply card.

Nothing like "STOP-AND-GO" maneuverability of WHITE 3000

No—nothing like the White 3000 turning radius, wide tread front axle and short wheelbase in municipal service.

It saves time in congested areas, heavy traffic, in narrow alleys.

And the White 3000 is engineered to exact operating conditions for bigger packer bodies, longer routes, more work.

For really modern garbage and refuse collection, go White 3000!

NEW EFFICIENCY FOR PACKER UNITS

CLAIRTON, Pa. has this modern White 3000 on the go to provide residents with the best in service. New "stop-and-go" efficiency in narrow alleys, crowded quarters. Shorter overall length also saves garaging space.

Wheelbase is 127½ inches, 10.00 x 20 tires, 507B transmission with 7.17 ratio, 89C rear axle.

IMPROVES SERVICE OF CONTAINER UNITS

RUBBISH removal at Food Fair Stores, Philadelphia, Pa., is faster, more efficient with this new White 3000. Excellent maneuverability in close quarters in store areas to back into tanks and load . . . reports Schiavo Brothers.

White 3026 has White Mustang engine, 89C rear axle, 7.17 gear ratio, 507B transmission.

THE WHITE MOTOR COMPANY
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Portable Melting Furnace For Rubberized Joint Sealers

357. The Hauck double jacketed melting furnaces use L-P as a fuel and a high flash point oil for heat transfer to assure close temperature control when melting rubberized joint sealers of all types. All details on this 16-gallon capacity unit are furnished in Bulletin 1081. Check reply card for your copy. Hauck Mfg. Co., 124 10th St., Brooklyn 15, N. Y.

Restoration and Protection Of Concrete Structures

385. A "How to Do It" bulletin describing the Thoro System for repair and sealing interior and exterior masonry surfaces is available from Standard Dry Wall Products, Inc., New Eagle, Pa. The treatment for every water problem is presented in illustrated case histories in this useful publication. Check the reply card for your copy.

Complete Information on All Types of Graders

396. Literature is now available from Huber-Warco Co., Marion, Ohio, on the different types of motor graders available from this company. The exclusive features, general specifications and power plants are fully described. Check the handy reply card.

Aluminum used for Roofing and Siding

418. An 8-page bulletin, describing the use of aluminum as roofing and siding material, has just been released by Kaiser Aluminum & Chemical Sales Corp., 1924 Broadway, Oakland 12, California. Aluminum can be used in water and sewage plants and industrial buildings. Complete information on its strength, appearance, corrosion resistance and lightness is included. Check the reply card today.

Data on Adjustable-Speed Magnetic Drives for Low-Lift Pumps

465. A catalog is available from Electric Machinery Mfg. Co., Minneapolis 13, Minn. that tells all about E-M Vertical Synchronous Motors and Magnetic Drive Units. Engineers check the reply card for information on this equipment for sewage pumps.

The Bros Line of Road Machinery

289. An illustrated folder describing the Bros line of road machinery is available from Wm. Bros Boiler & Manufacturing Co., Minneapolis 14, Minn. Full descriptions of Bituminizer distributors, Spraymatic spray bars, several types of compacting equipment and other units are included. Check the reply card.

A Fully Rotary Compressor by Jaeger

209. Complete information is available from The Jaeger Machine Co., Columbus 16, Ohio on this 2-stage, oil-cooled rotary compressor. Features include 80% fewer moving parts, up to 30% less weight, vibrationless operation and 100° cooler air. For full details check the reply card.

Helpful Data On Pipe Tools

230. Toledo drop head ratchet threaders are light, compact, ideally suited for work in tight corners. Three models for ⅛" to ¾"; ⅜" to 1¼"; and ½" to 2" pipe all feature quick change of sizes. Get Catalog No. 25 from Toledo Pipe Threading Machine Co., Toledo, Ohio. Check the reply card.

●

REFUSE COLLECTION AND DISPOSAL

How New, Larger Load-Packer Cuts Refuse Collection Costs

51. Ever increasing problems in refuse collection work include longer hauls and higher costs of labor, chassis, operation and maintenance. As a solution, Gar Wood offers Load-Packers with dual-thrust compaction that gives big capacity on shorter wheelbase, plus safe, labor-saving operation. Profusely illustrated Form W-144 tells why you should investigate Load-Packers. Check reply card or write Gar Wood Industries, Inc., Wayne, Mich.

Developments in Refuse Collection

119. The "Dempster-Dumpmaster" system for refuse collection combines the advantages of detachable containers for bulk collection, convenient front-end loading and compaction in a sealed body. Be sure to investigate the application of this system to your collection needs. Complete data offered by Dempster Bros., Knoxville 7, Tenn. Check the reply card today.

Efficient Material Handling to Reduce Incineration Costs

148. Blaw-Knox Buckets specially designed for refuse and garbage handling are described in 22-page Bulletin 2350-R. Illustrations show progress of material through a modern municipal incinerator plant. Dimensions and incinerator bucket specifications are included. Blaw-Knox Equipment Div., 2124 Farmers Bank Bldg., Pittsburgh 22, Pa. Check the reply card.

New M-B Packer Body Designed for Maximum Payload

309. The M-B Packer Body, designed to provide maximum payload on a minimum size, low-cost truck, features effective, simple compaction system; provides easy loading, positive discharge, all safety features. Available in 12-14-16, 20, 24 cu. yd. capacities. Get all the facts from M-B Corp., New Holstein, Wis.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 8, Wis. Get your copy by checking the reply card; you'll find this booklet both interesting and valuable.

What You Should Know About Refuse Incinerators

362. Two helpful bulletins tell what you should know about low cost refuse incineration for the small community and for larger cities. Your questions on mechanical stoking, burning rates and operating problems are discussed. Get Bulletins 217 and 223 from Nichols Engineering & Research Corp., 70 Pine St., New York 5, N. Y. Just check the reply card.

How Mud-Jack® *stabilizes sub-grades*

Here is an easy, low-cost way to raise settled sidewalks, street slabs, curbs, gutters, driveways. Koehring Mud-Jack pumps soil-cement slurry under pressure into small holes drilled through pavement. This displaces air pockets, water or water-saturated materials, raises the concrete slab, leaves firm permanent sub-grade. Two sizes: compact, portable No. 10 for cities, and the big No. 50 Mud-Jack for preventive maintenance and low-cost repairs on highways.

SEND FOR 12-PAGE ENGINEERING HANDBOOK ON MUD-JACK METHOD

KOEHRING Co., Milwaukee 16, Wis. *Send us free Mud-Jack booklet*

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Filters are in service more as wash water cycle shorter. Better removal of bacteria, taste, odor. Increased Filter output, better effluent. Ideal for industrial acid and Alkaline solutions. Ask any user.

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822 E. 8th St. • Erie, Pa.

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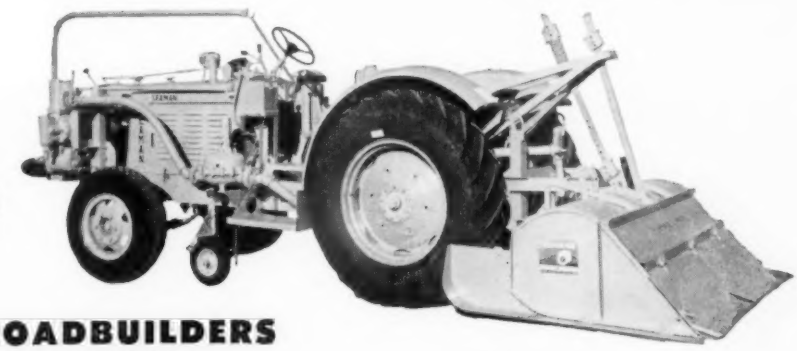
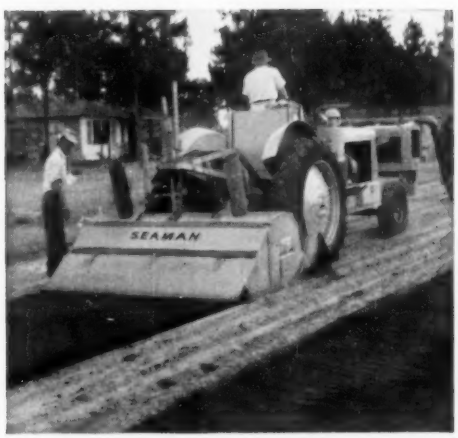
Today's most versatile roadbuilding machine. Equipped with pump, tachometer assemblies, volumetric meter, spray bar to apply bitumen or water with mixing-in-place operations. Also available with new UNDERBODY SCARIFIER, for extra versatility in light scarifying.



HOW ROADBUILDERS BEAT THE CLOCK . . .

22-Foot Bituminous Road Base Completed at Mile-A-Day Rate with New Seaman-Andwall TRAV-L-PLANT

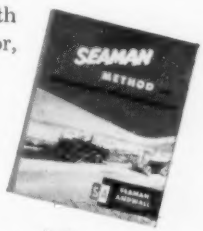


Above — Seaman Self-Propelled TRAV-L-PLANT in bituminous parkway construction, Jacksonville, Fla. Binder is pumped from transport ahead of the Seaman.

Contractors today are building better, more durable bituminous roads at lower cost, with greater strength, higher densities —at a mile-a-day production rate. Principle reason for this speed-up is new versatility built into the Seaman TRAV-L-PLANT.

The new TRAV-L-PLANT is a double-duty and often triple-duty machine that performs "in-place" mixing and binder application, together with light scarification, in one time-saving simultaneous operation — on new roads and reconstruction. Self-propelled, the TRAV-L-PLANT pumps binder into the mix from a transport truck operating at the side or ahead. Full tachometer assemblies and volumetric meter provide precision application through a spray bar positioned in the mixing chamber. There is no time delay between base stabilization and binder application and mixing; bitumen has no time to cool, and run-off or migration is prevented.

The TRAV-L-PLANT leaves the surface partially compacted, ready for final rolling with the Seaman-Andwall Pneumatic Compactor, to final density.



Get the facts!

Write for bulletin TPS-B-34 "SEAMAN METHOD OF BITUMINOUS STABILIZATION"

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SEAMAN-ANDWALL CORPORATION

266 North 25th Street, Milwaukee 1, Wisconsin

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PIPING LAYOUT IS SIMPLER with Gentile* FLOW TUBES

...THEY NEED SO LITTLE ROOM

Gentile Flow Tubes are short. They need only minimum straight runs entering and following, and can be installed at practically any accessible point where flow conditions are reasonably steady.

Flow Tubes are furnished with individual head capacity curves, and for unusual piping arrangements, calibration curves for simulated conditions can be furnished.

Guaranteed

- Accuracy
- Minimum Head Loss
- Reproducibility

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AUTOMATIC VALVES • CONTROL VALVES • SAFETY VALVES • FLOW TUBES

Now's the time to mail this month's Readers' Service Card.

STREET LIGHTING AND TRAFFIC CONTROL

Investigate These Street Lighting Standards

54. You can get complete data on Kerrigan factory-built "Weldforged" street lighting standards, brackets and mast arms by using the handy coupon. Check these strong, well designed, inexpensive steel standards for practical street and highway lighting. Handsome 26-page folder includes data sheets on floodlighting and area lighting applications. Kerrigan Iron Works, 1033 Herman St., Nashville, Tenn. Use the reply card.

Safe-T-Cones Solve Traffic Problems Night and Day

136. For data on Safe-T-Cones, the all-rubber traffic guides available in two sizes, 18" and 28"—painted or reflectorized for day and nightime use—get bulletin from Radiator Specialty Co., Charlotte, N. C. Information included on Safe-T-Signs which add greatly to value of markers. Check the reply card.

Cure for Traffic Congestion

238. A prescription for curing traffic congestion by the use of rapid transit is given in the Bulletin No. GEA-6389, available from the General Electric Company, Schenectady 5, N. Y. This 2-color publication gives a complete discussion of how drivers can be converted into transit riders, what a transit system should consist of and why expressways alone won't solve the problem. For complete information check the reply card.

Engineering Data on Aluminum Lighting Standards

256. Latest designs and applications of all-aluminum, seamless, tapered lighting standards, traffic signal posts and elliptical lighting brackets plus detail drawings and mechanical specifications are provided in a comprehensive 16-page bulletin issued by Pfaff & Kendall, 84 Foundry St., Newark, N. J.

WEED AND INSECT CONTROL

Investigate "Tifa" For Insect Control

47. With "Tifa", the Todd Insecticidal Fog Applicator, chemicals are distributed as a true, clean fog. Use reply card for full data on public health programs. Products Div., Todd Shipyards Corp., Columbia & Halleck Sts., Brooklyn 31, N. Y.

Chemicals for Complete Weed Control

79. "Ureabor" weed and grass killer completely destroys vegetation about fence lines, parking lots, storage areas and similar places. Ease of application and maximum long-lasting results make this material the choice where a nonselective herbicide is required. For latest data write Pacific Coast Borax Co., 630 Shotto Pl., Los Angeles 5, Calif. or check the reply card.

Weed Killing Case Histories

205. Long term weed and grass control . . . costs less with Du Pont "Telvar" weed killers. Interesting folder published by Grasselli Chemicals Dept., E. I. Du Pont de Nemours & Co., Inc., Wilmington 98, Del. Full color photographs demonstrate effective action; text shows application methods for best results. Check the reply card for your copy.

How to Simplify Your Weed Spraying Operations

293. Chemical spraying for weed control is made simpler and easier by the Tarrant "Direct from the Drum" sprayer, a compact power spraying unit which will handle dozens of jobs. Get full data from Tarrant Mfg. Co., 27 Jumel St., Saratoga Springs, N. Y. Check the reply card.

New! The Sherman Major Power Digger

with Many Advanced Features to Increase Versatility and Earning Power

The all new Sherman Major Power Digger has been engineered to take full advantage of the ruggedness and economy of the Fordson Major Diesel Tractor. This heavy-duty unit will dig 12 feet below grade, reach 18 feet 3 inches behind the tractor rear axle, dig throughout a swing arc of 180° and will carry a full bucket to a height of 8 feet 8 inches for loading trucks.

Additional features of the new Sherman Major Power Digger include twin crowd cylinders, heavy steel plate construction, large diameter hinge pins, heavy steel castings, replaceable hardened steel bearings at hinge points, and a newly designed dipstick, boom, cylinders, bucket and sub-frame assembly.

Write for bulletin No. 541.

See the Sherman Major Power Digger soon at your local **FORD TRACTOR DEALER**

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ROYAL OAK, MICHIGAN
POWER DIGGERS* • FRONT END LOADERS • FORK LIFTS
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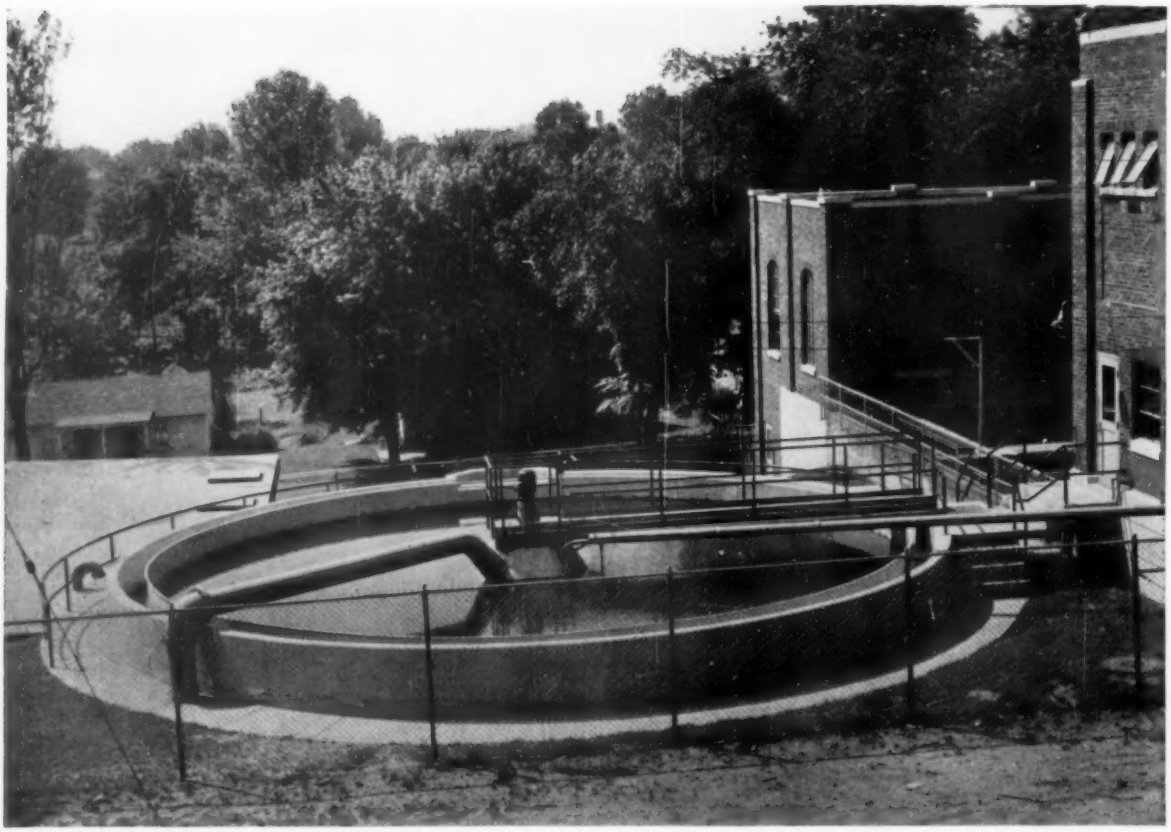

RAPID CLARIFICATION: Storms can increase Wabash River turbidity from 50 to 1500 ppm in as little as six hours! No matter how much or how fast turbidity changes, this Permutit Precipitator cuts it to less than 5 ppm in one fast step!

Clear water for Mount Carmel despite rapid turbidity jumps of 50 to 1500 ppm in 6 hours!

GROWTH OF POPULATION and increasing settling-basin odors from sewage and oil-field wastes persuaded Mount Carmel officials to look for a more efficient water-treatment plant. The new plant would have to deliver twice as much water . . . eliminate bad odors . . . handle spurts of *high* turbidity.

HOW IT'S DONE: A suspended sludge-blanket type of equipment was indicated, and a Permutit Precipitator was installed. Now they get 2½ mgpd of clear water *in half the time* it took two old settling basins to treat only 1½ mgpd! All with *no increase in manpower*. There are no more bad odors during treatment. Chemical costs are lower.

FILTER SAVINGS: Added to the existing three filters . . . two new filters with Permutit Monocrete® Underdrain Systems that are non-corrodible, low in cost, easily built.

AUTOMATIC FEATURES: Mount Carmel's Precipitator has photoelectronic control. The unit is automatically blown down in direct proportion to the flow rate and the amount of total solids precipitated. Since the three existing filters had obsolete controls, five new gravity filter operating tables were installed to control backwashing and filtering automatically!

"Everything is running smoothly. We're getting a better grade of water . . . clearer water," reports Supt. Elmo Conrady.

"It's all automatic. Mud goes right back into the river . . . eliminating the cleaning of basins," reports Chief Operator Cedric Seaton.

"It has given excellent performance since operation began," report Warren & Van Praag, Inc., Consulting Engineers, Decatur, Illinois.

PERMUTIT WILL WORK WITH YOU to modernize your present plant or to plan a new one. Call us early in planning so we can be of most help. The Permutit Company, Dept. PW-4, 330 West 42nd Street, New York 36, N. Y.

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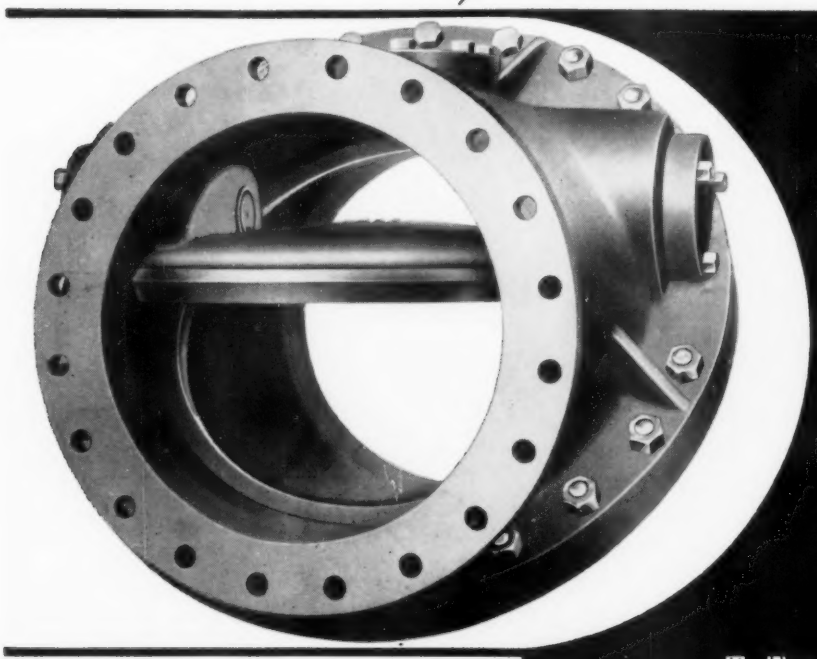
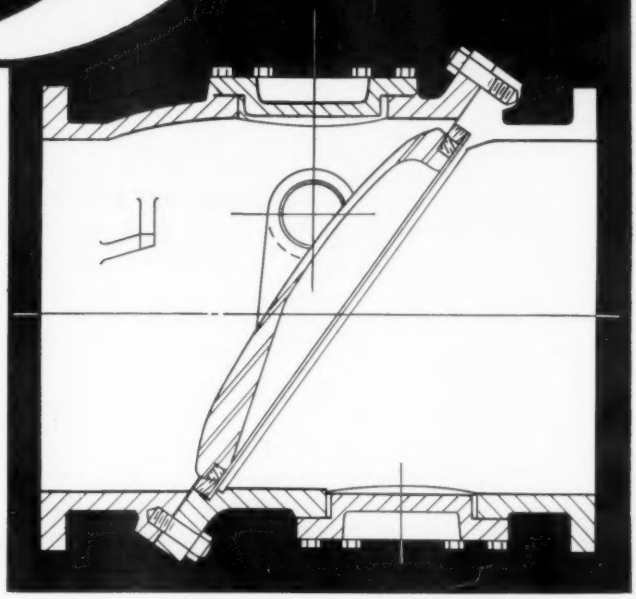
CHAPMAN TILTING DISC CHECK VALVE



the Valve with the Right Idea!



Here is a cross section of top check valve performance at lowest cost. It's the idea in back of Chapman's Tilting Disc Check Valve . . . the valve that's designed to go with the flow.

When the flow is on, specially designed "airfoil" disc balances perfectly in open position. Fluid holds it tightly against stops. There's no vibration . . . no flutter. It's quiet. And note the design. Ample room is allowed around disc to assure low flow resistance.

When the flow is reversed, disc drops surely, quietly, *tightly* on special beveled seat. There's no banging, no slamming, no scraping or wearing of disc and seat faces, no damage to piping joints or the valve itself. It's as simple as that. It's as *sound* as that. It has the right idea.

Complete information on these rugged, quiet, long life check valves is highlighted in our Catalog 30-A. Whether you want iron or steel construction . . . whether you handle fluids or gases under a wide range of pressures . . . this catalog gives you all the facts. Send for your up-to-date copy, today.

The CHAPMAN VALVE Mfg. CO.

INDIAN ORCHARD, MASS.

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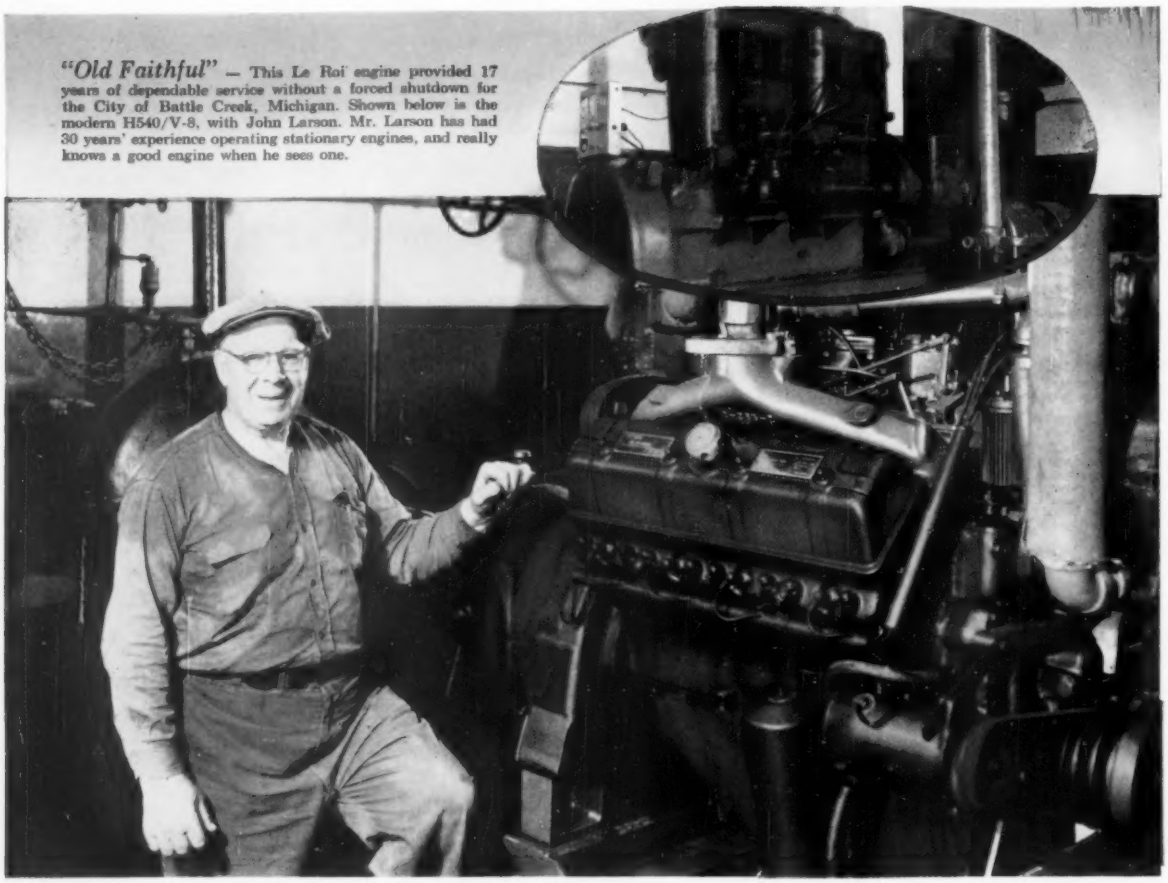

"Old Faithful" — This Le Roi engine provided 17 years of dependable service without a forced shutdown for the City of Battle Creek, Michigan. Shown below is the modern H540/V-8, with John Larson. Mr. Larson has had 30 years' experience operating stationary engines, and really knows a good engine when he sees one.

122,105.6 hours logged with only four overhauls

...dependable performance like this proves the value of Le Roi engines

In 1937, the City of Battle Creek installed its first Le Roi engine. Seventeen years later, when it was time to modernize, this engine had piled up the amazing total of hours shown above.

This is just one more example of Le Roi dependability. It is also proof of the excellent maintenance work performed by John Larson and his staff.

In 1954, "Old Faithful" was replaced by Le Roi's H540, a modern short-stroke V-8. The H540 normally operates at 1500 rpm, but, because of its short stroke V-8 design, piston speed is no greater than that of longer stroke, slower speed engines.

Moreover, the H540 provides new flexibility. This flexibility really paid off during flood conditions when the electric pumps were shorted out. The H540 ran up to 2100 rpm and, by so doing, carried the entire plant load for several days.

Performance during this emergency clearly indicated the advantages of the H540's short-stroke V-8 design. It proved that you get more horsepower per dollar and more horsepower per space. Other plus factors are easier servicing and easier installation.

Whether it's for continuous or standby service, or for pumps, blowers, or generators, it pays to use Le Roi engines. Le Roi power is dependable, low-cost power — power that can help ease the tax load in your community. You can get it in sizes ranging to 645 hp., or in custom generator sets from 50 to 350 KW. Write us for detailed information.

E-103

LE ROI *Division of Westinghouse Air Brake Co.*

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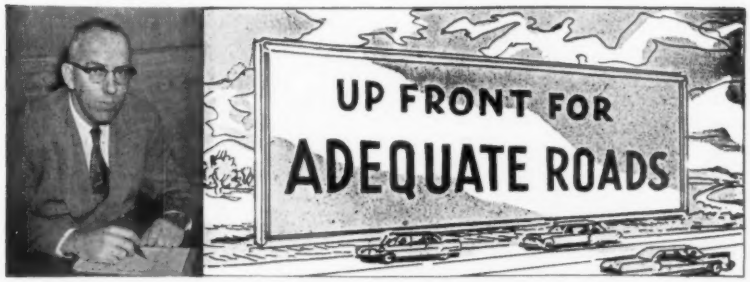

by **LEO J. RITTER, JR.**
Highway Consultant

Increasing Engineering Productivity—Among the interesting papers presented at the recent meeting of the Highway Research Board was one by L. R. Schureman of the Bureau of Public Roads, on "Increasing Productivity in Engineering". The paper is devoted to a discussion of increasing productivity through improved engineering operations, particularly in location, road design, bridge design, and the preparation of plans and estimates. Included among the devices for increasing productivity are the following:

(1) Use of Aerial Surveys and Photogrammetry—This is one we've harped on before. Tremendous time and manpower savings are possible through the use of aerial photographs and maps made from aerial photos for preliminary and final location, preparation of plans and estimates, right-of-way determinations, drainage calculations, soil identification, and many other purposes.

(2) Mechanization of Survey Computations—We write about this one last month. There is no doubt that the increased use of modern business machines can lead to very large savings in engineering time.

(3) New Surveying Instruments—Various new and improved surveying instruments which have various time-saving features are now on the market. Among these is a new self-leveling level, which reportedly reduces the time required to run levels by 50 percent.

(4) Standard Designs and Plans—There is increasing use of standard designs for various highway and street accessories, design aids (such as nomographs, charts, etc.), and bridge elements. As the pressure mounts for increased production, more and more use must be made of standard designs for small structures and the less important and cheaper elements of the highway cross section.

(5) Preparation of Plans—Many man-hours of engineering effort can be saved by "streamlining" plans. This includes the elimination of all unnecessary details and duplication from plan sheets, use of standard sheets, use of typing or "art type" to replace hand lettering, elimination of ink tracings, utilization of modern methods of photographic reproduction, etc.

Mr. Schureman has other good suggestions, too. Increased engineering productivity is a matter of vital concern now, with the increased highway program in the immediate offing. Let's face it; in most cases, highway organizations are not going to be able to attract enough civil engineering graduates in the next few years to do much more than meet replacement requirements. One of the few bright rays in the highway manpower picture is the possibility of greatly increasing the productivity of engineers already in the field, by the use of methods and equipment *now* available.

The Kelly Ball—That gadget keeps popping up again. This time there's an article in *Public Roads* for February by W. E. Grieb and R. A. Marr, Jr., explaining recent tests conducted by the Bureau of Public Roads. In case you have forgotten, the Kelly ball is a device used to measure the consistency of fresh concrete in place. As modified by the BPR, it consists of a 6-in. dia. weight with a hemispherical bottom fastened to a graduated handle. The handle is free to slide through a light stirrup which is supported by plates that are placed flat on the fresh concrete. Ball and handle weigh 30 pounds; penetration is measured by the distance the handle slides through the stirrup.

Plastic concrete can be tested after placement in the forms and prior to any manipulation, or in suitable containers such as wheelbarrows or buggies. In making the test, the surface of the concrete is smoothed and leveled. The ball is

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ECONOMY,
DURABILITY,
Every Step of the Way.

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IRVING GRATINGS

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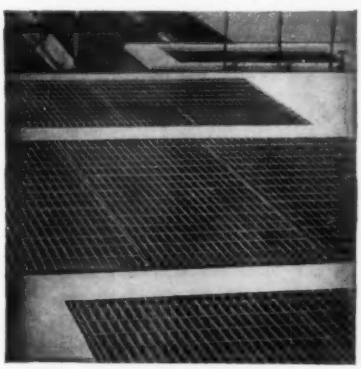

FOR: Walkways, Catwalks, Flooring, Draingrates, Stairways, Stair Treads.

IN: Sewage Disposal Plants, Water Treatment Works, Power Stations, Bus Laundries, and other Public Works Installations.

Specify IRVING GRATING for:

★ Light Weight
★ Simple Installation
★ Self-Draining Features
★ Self-Ventilating Qualities
★ Minimum Maintenance Cost
★ Custom-Built Perfection
★ Prompt Delivery
★ Safety ★ Durability

"A Fitting Grating for Every Purpose"
Ask for Illustrated Catalog

IRVING SUBWAY GRATING CO., INC.
ESTABLISHED 1902
OFFICES and PLANTS at
5053 27th St., Long Island City 1, N. Y.
1853 10th St., Oakland 20, California

Four-wheel drive, and tires 2' wide, give Tournatractor ample traction to make full use of its 208 hp.

Here's what high-speed on rubber can do for you

Tournatractor, with 19 mph forward speed and 8 mph reverse speed, can do many tractor jobs twice as fast as a crawler-tractor.

Drives anywhere

Because of its big low-pressure tires, Tournatractor drives anywhere under its own power. Job-to-job moves can be made across pavement, over curbs, sidewalks, and railroad tracks. On long moves it saves time, bother, and expense of locating a trailer, moving in extra manpower and transport equipment, loading and unloading.

Reduces maintenance

Tournatractor greatly reduces maintenance and service costs by eliminating some 500 wearing parts that grind through dirt in a crawler-track assembly. Eliminated also is the friction caused by grit-grinding in the track assembly which reduces effective working horsepower.

Easy to operate

With simple easy-to-handle power controls, and comfortable, adjustable, foam-rubber seat, operator on Tournatractor works comfortably, with less fatigue, maneuvers faster, gets more work done, in less time, with less effort.

High-speed performance

Constant-mesh transmission eliminates delays in changing gears . . . saves vital momentum . . . gives any gear-ratio instantly. As a pusher or dozer, Tournatractor high-speed reverse (up to 8 mph) is a very important time saver.

Versatility helps get more work done

Wide range of attachments increase Tournatractor range of applications, extend length of work season. Find out for yourself how high-speed C Tournatractor can take over a major percentage of your tractor work, and save you money. Ask for owner-verified job reports on work similar to yours.

Tournatractor—Trademark Reg. U.S. Pat. Off. T-954-G.z

LeTourneau-WESTINGHOUSE Company

Peoria, Illinois

A Subsidiary of Westinghouse Air Brake Company

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held vertically by the handle in very light contact with the surface of the concrete. The handle is then released and the penetration of the ball measured to the nearest 1/10 inch. The test requires less than 30 seconds to perform. A limited number of field and laboratory tests by the BPR show good correlation between the Kelly ball and slump tests.

Advantages of the test include testing the concrete in place, speed, simplicity of the apparatus, and the fact that there is no limitation because of the size of aggregate used in the concrete.

Traffic Counts—A very interesting report has been issued by the Highway Department of Cook County, Illinois (Chicago). Entitled "Moving Vehicle Method of Estimating Traffic Volumes and Speeds", it sets forth the results of a study designed to test the feasibility of a method of estimating traffic volumes on urban streets by the use of extremely short counts taken from a moving vehicle.

This method requires the use of a car, driver, and one or more observers, depending on the details sought. As the moving test car moves along in the stream of traffic, the observer records the time required to drive the section under study, the vehicles moving in the opposite direction and met by the moving test car, the vehicles overtaking the moving test car, and the vehicles passed by the moving test car. These observations are the basis for the estimates of traffic volumes and velocities of the highway section traversed.

Without going into detail on the statistical analyses set forth in the report, one of the conclusions reached was that the standard error in determining the five hour volume is sufficiently small in certain applications to consider use of the method in preference to other existing methods.

Big advantage of the method is the saving in time and man-hours.

Gratefully Received—A couple of months ago, we asked for suggestions from you readers relative to the content of this column. Well, we got a letter or two. One of them was from E. L. Tennyson, Traction Commissioner of the City of Youngstown, Ohio, who raised an interesting point regarding methods of increasing the capacity of new high-volume highway facilities. Mr. Tennyson points out that the new Congress Street Expressway in Chi-

cago will have a capacity of some 48,000 persons one-way at the peak hour. This does not mean that there are 18 lanes of highway traffic. Rather, rail facilities which will accommodate 40,000 people will occupy the center "lane" of the Expressway, while there will be three lanes of highway traffic in each direction. Mr. Tennyson feels that "to provide free highways without parallel provisions for railways merely puts the railways out of service competitively and transfers impossible burdens to the highway system". His basic point is well taken. It's an axiom that all forms of transportation must be given equitable consideration if we are to develop an integrated, adequate national transportation system. Also heard from Joe Leadabrand of the Portland Cement Association—he and his boys are continuing to work toward the simplification of present procedures of determining the proper cement content to be used in soil-cement stabilization.

Highways 'n Byways — We rather agree with that somebody who said "Among the chief menaces on our highways are drivers under 21 going over 65 miles per hour and drivers over 65 going under 21 miles per hour". The Colorado Highway Commission has made a recommendation indicating the time is not ripe for the construction of a long-debated highway tunnel beneath the Continental Divide. Governor Herter of Massachusetts has asked the state legislature to approve an increase in the state gasoline tax of one cent per gallon. Major General L. W. Prentiss will become executive vice president of the American Road Builders' Association May 1, replacing Lt. Gen. Eugene Reybold, who is retiring; you'd think ARBA was a branch office of OCE, wouldn't you? Newton F. Ronan, who has been with the Department of Public Works of New York State for 45 years, has been appointed Superintendent of Operation and Maintenance. Plans for the 279-mile northern extension of the Florida toll road, from Fort Pierce to a terminus in Duval County, have been approved by the Florida Turnpike Authority; target date for its completion is 1958.

• • •

Cost of Repairing Water Meters

Detroit reports that the cost of repairing ⅝-in. meters damaged by frost averaged $4.76 each; those damaged by hot water $6.11; and those damaged by wear and tear $5.01.

One man with D Tournapull

cuts costs on landfill garbage disposal

One man, operating a dozer-equipped D Tournapull, can handle *all* excavating and covering operations on a city landfill disposal dump. In fact, in many cases these machines excavate and cover on several dumps, or supplement disposal work with other dirt-moving service for streets, parks, etc.

There's only one man to pay — one machine to service and maintain, one machine to buy.

Excavates disposal ditches

If eroded wasteland is available, Tournapull can employ the landfill method to fill in gullies, and eventually reclaim the land.

If dump area is flat, versatile 138 hp Tournapull digs disposal ditches of any length or size, and uses excavated material to cover dumped refuse.

Spreads, compacts, covers garbage

As garbage is trucked in, the "D" dozes it into place in the trenches. Normal back-and-forth travel of the rubber-tired rig solidly compacts refuse into minimum space.

For sanitary sealing, D Tournapull covers the garbage by one of two methods: (1) dozes dirt down from the trench walls, or (2) hauls in dirt from excavation of the next parallel disposal ditch.

Big 18:00 x 25 low-pressure tires, power-transfer differential (which automatically transfers power to the wheel on firmer footing), and positive power steer, help the "D" keep ahead of trenching and filling schedules in all kinds of weather — frequently with time to spare.

Handles odd jobs in spare time

Fast-moving, rubber-tired "D" permits making profitable use of any short waiting intervals, to handle scattered assignments. Just "say where"! Operator hops on and runs Tournapull to the next work site — cross-country, or over paved highways — at speeds to 28 mph. No waiting for trailer! No blocking or loading!

Tournapulls maintain alleys, streets, levees . . . haul and spread cinders or gravel for surfacing . . . grade parking lots . . . remove snow . . . "pinch-hit" in hauling garbage.

Consider what this versatility can mean on your city landfill, street, alley, and park maintenance programs. Get all the facts. Write, or ask your LeTourneau-Westinghouse Distributor about high-speed, electric-control D Tournapulls TODAY!

Tournapull—Trademark Reg. U.S. Pat. Off. DP-1017-P-z

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Truck, truck body, and truck-mounted equipment purchases are increasing in the field served by PUBLIC WORKS Publications. This is in response to the rapid pace of improvements and development of urban, suburban and exurban areas as populations and industries shift and expand.

These purchases are 94 to 98% directed by engineering and technical administrative officials of cities, counties, and states. These men are primarily responsible for providing the essential facilities for modern living which public works alone make possible.

This tremendous integrated market includes every kind of equipment, materials, and service for highways, streets and airports, water supplies and distribution, sewerage, waste and refuse collection and disposal, recreational areas, and other vital public works functions.

Each issue of PUBLIC WORKS Magazine is packed with material these important buying influences demand. The STREET and HIGHWAY MANUAL and Catalog File, The WATER WORKS MANUAL and Catalog File, and The SEWERAGE MANUAL and Catalog File spell out the needs and means for the creation of these basic facilities.

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NEW ..International

plus new desig

124 Net Engine Horsepower. In International Drott Machines, Engine develops 134 Net Horsepower.

182 Series

TD 18

TD-18 diesel (series 182) delivers 103 drawbar horsepower, with weight of 29,050 pounds (without equipment). All-weather electric starting, standard equipment. "New look" visibility, operating ease never before available. New heavy-duty, swinging-door type radiator guard is "standard"—for carrying heavy front-mounted equipment. Gives big tractor performance in pioneering under roughest conditions. Powers 3-yard International Drott Skid-Shovel, anywhere.

95 Net Engine Horsepower.

142 Series

TD 14

TD-1
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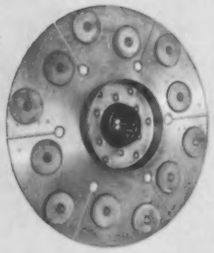
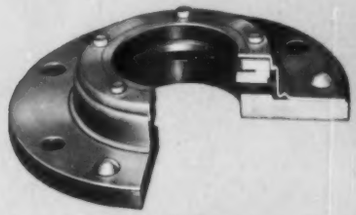
Drott
Pipe-L

No costly delay from a "killed" or cold engine—you start fast! Famous International *gasoline-conversion* diesel starting—*actual* "in-seat" starting—is *standard equipment* on this new crawler line. With "push-button" ease, you get seconds-fast starting, whether the engine is cold, or stopped! And you're on the job seconds-fast, when minutes are dollars.

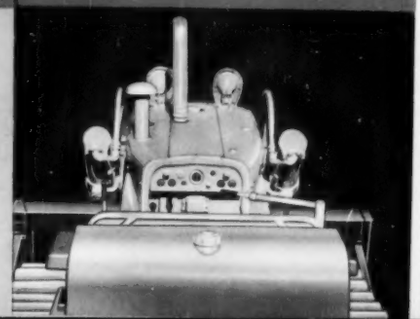
Cerametallic Engine Clutch Facings Save power, defy heat, prolong life! Uncomplicated, *familiar-to-all* engine clutch design of these new crawlers have *power-holding, heat-defying, long-lasting* Cerametallic facings. These facings reduce lever-pull up to 50%, provide amazing heat immunity, add service freedom, cut upkeep!



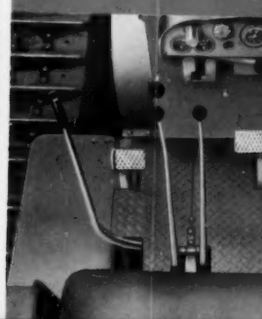
Now . . . 500-hour lube intervals with new metal-to-metal, track roller seals! You save the time and expense of frequent inspections or lubrications, with the new *full-floating*, cartridge-type, track roller seals provided on the TD-24, TD-18, and TD-14. These precision-lapped, metal-to-metal seals are so effective they give you *safe* 500-hour intervals between roller lubrications!



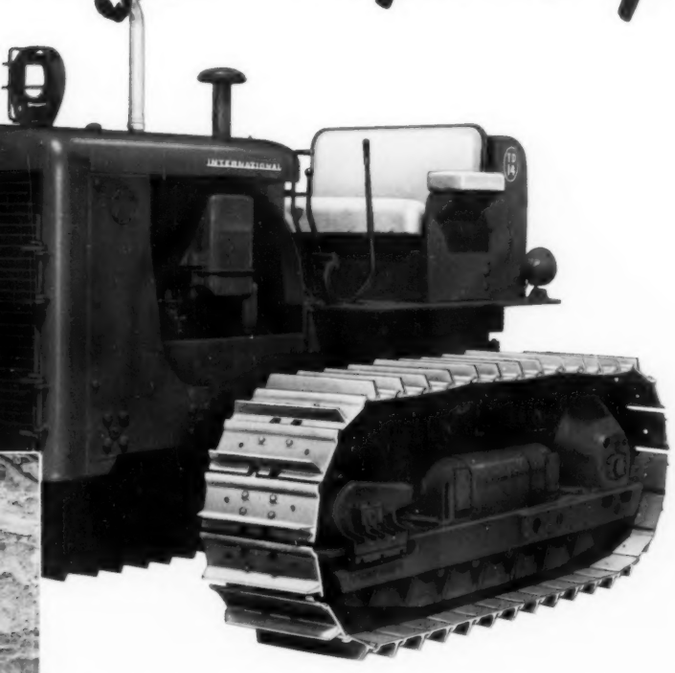
Control Tower Visibility adds operating efficiency! See how new International crawlers are streamlined for complete job-control visibility. Seat is amply high to provide full view of equipment, terrain, and variations requiring operator action, to maintain efficiency.



Clean, safe deck clear
Look down on that safe, c
—a platform for full
wide, man-size seat is f
foam rubber padded. I
tralized for one-glance ch
cigarette lighter is provid
needless stops!



nal® Crawlers *give you Bonus horsepower—*
esign to speed your jobs, control your costs!

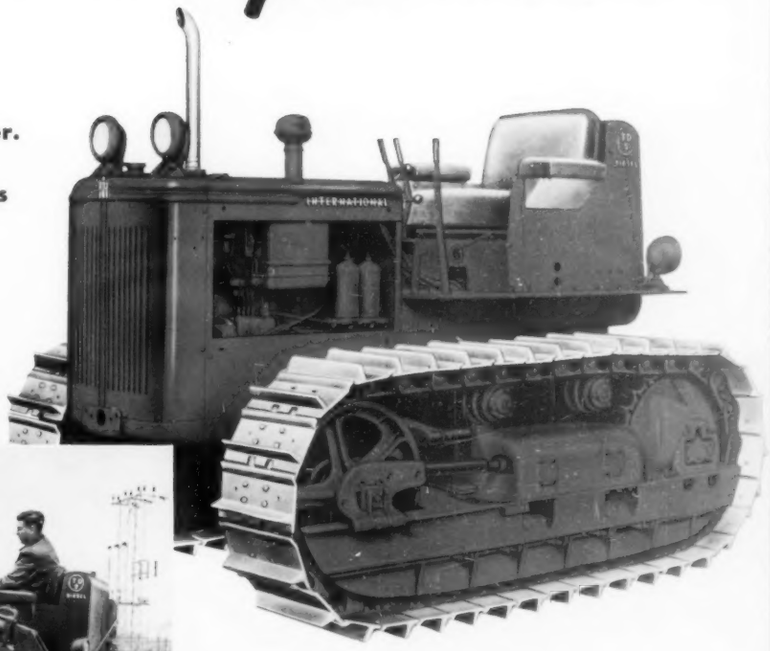


TD-14 (series 142), 78.5 drawbar hp; weighs 21,095 pounds (without equipment). Features "new look" engineering, job-speeding visibility, new equipment-carrying and operating strength. All-weather electric starting, standard equipment. It's a fast, responsive, big-capacity dozing tractor. Powers 2¼ cu. yd. International Drott Skid-Shovel or Four-In-One; 15-ton capacity Superior Pipe-Boom; other similar-sized equipment.

66 Net Engine Horsepower. In International Drott Machines, Engine develops 71 Net Horsepower.

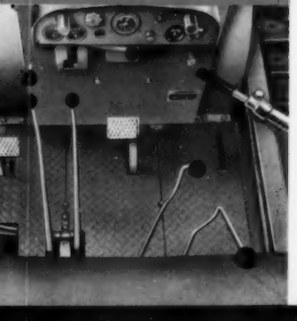
91 Series

TD 9



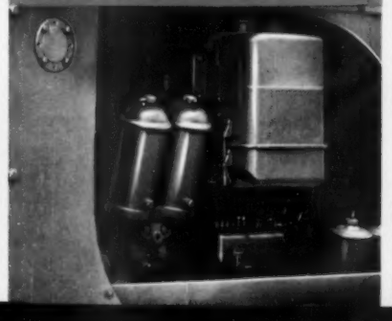
TD-9 diesel, (series 91), delivers 54.5 drawbar hp—up 32%. Operating weight (5-roller model), without equipment, 12,000 pounds. Now up in a new heavy-duty job range. New power is backed by new power train and track frame strength, new operating and servicing ease. Powers International Drott 1½ cu. yd. Skid-Shovel and other equipment requiring similar power.

afe deck cleared for action! n on that safe, clean, flush deck form for full production. The n-size seat is fully-adjustable; ber padded. Instruments cen- or one-glance check-up! Even a lighter is provided, to prevent topsl



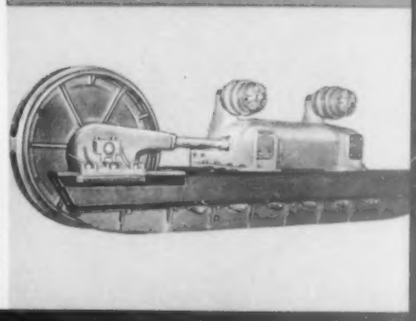
Pressurized Closed Cooling System for Positive Performance Protection! New pressurized cooling systems provide fast warm-up under thermostatic control—and positive *ideal temperature control* with forced circulation through full-length jackets. That aids clean combustion, guards oil film strength, protects performance. Radiator core assembly is easily-removable, without disturbing radiator guard or mounted equipment.

480-hr. full-flow lube oil filters guard bearings, cut upkeep! Every *drop of oil* on its way to lubricate moving engine parts must pass through these new abrasive-trapping micron-type filters—with the capacity, strength, and efficiency to give 480 hours of wear-fighting, upkeep-cutting duty!



Hydraulic Power Steering Inspires Operator Cooperation! New hydraulic power steering of the TD-14 and TD-18 cuts operator fatigue—and along with the other big effort-saving advantages, makes it easier than ever to deliver full-capacity production! TD-6 and TD-9 have spring boosters to lighten the operator's job.

"Bridge-strong" track frames for "slam-bang" conditions! You are looking at the strongest track frame in the industry for crawlers of TD-18 and TD-14 size! Heavy steel box-section beams, weld-joined to heavy stress-relieved steel plates—and rigidly gusset-braced—they're your foundations for record-making "rough-and-tumble" performance!

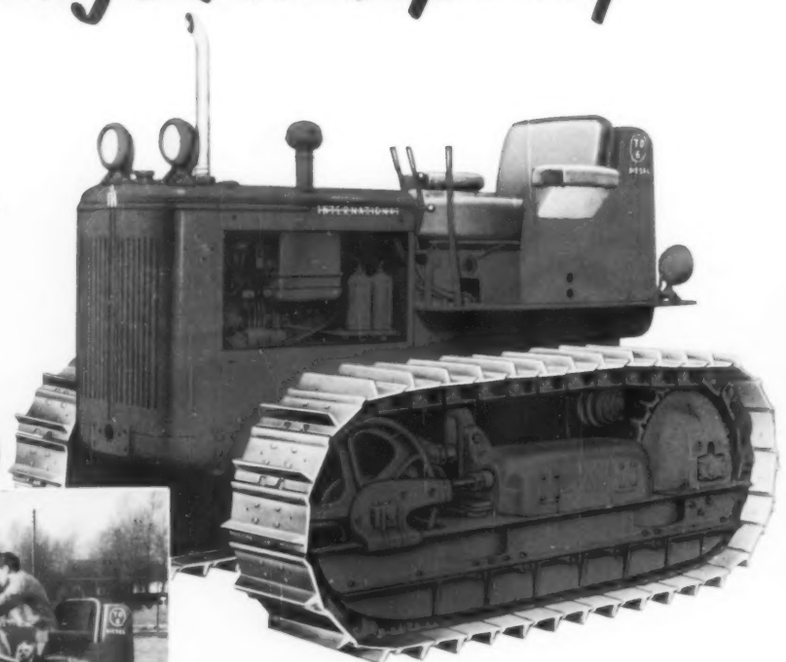


Steps up a size... in job range and capacity!

50 Net Engine Horsepower. In International Drott Machines, Engine develops 55 Net Horsepower.

61 Series

TD 6



TD-6 diesel (series 61), 41.5 drawbar hp, up 23%! Steps up a whole size in work capacity and earning ability. Operating weight (5-roller model), without equipment, 8,890 pounds. Powers 1-yard International Drott Skid-Shovel or Four-In-One; serves as clean-up dozer unit on any-sized contract; versatility and low operating cost to do many sizes of jobs for every size of contractor.

TD 24

The capacity leaders in

Massive—with 43,080 pounds of rock-dozing, scraper-pushing brawn (7-roller torque converter model)*—the TD-24 can give them all a lesson in operating ease, big capacity, and positive load control! Has instant high-low range and exclusive Planet Power steering to give you its tremendous *pushing*, *pulling*, and *lifting* power on any terrain—with responsiveness not available elsewhere! *Live power on both tracks, on every turn!* Backed by equipment engineered to match its strength and power!

*Gear Drive 7-roller model weighs 42,780.

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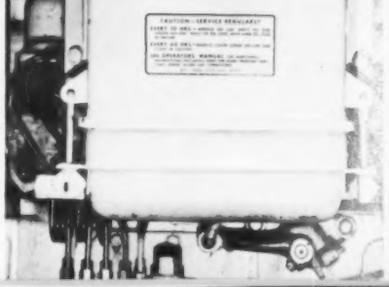
Full-view, one-glance panel saves time—cuts effort! One quick glance at this new full-view panel, with centralized instrument grouping, gives the operator the instant check-up, to assure that lubrication, generator, and cooling system are "perking" for full production!

New Fold-over Seat Aids Fast, Centralized Servicing! New fold-over seat of the TD-6 and TD-9 models allows operator to give you the time and convenience advantages of centralized steering clutch assembly servicing. Lubricant fittings are conveniently grouped and fully accessible!

Thorough air filtration assured by new under-hood cleaner! Instead of being "in your lap," or a knee-bumping obstruction, air cleaners of the new International crawlers are side-mounted—for easy accessibility, yet out of the way. They have big capacity and high efficiency, too, for positive air filtration!



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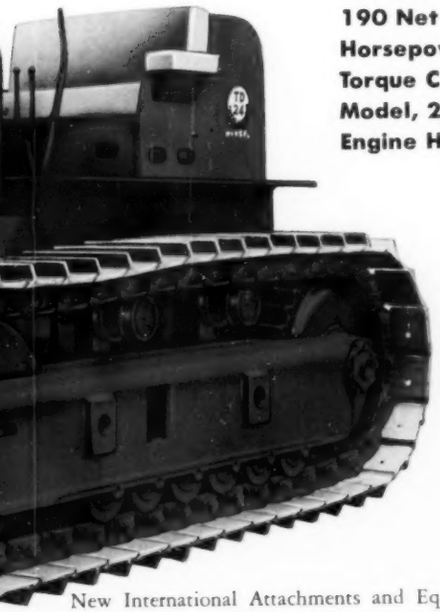

Gear Drive Model, 190 Net Engine Horsepower
Torque Converter Model, 200 Net Engine Horsepower

New International Attachments and Equipment team with new bonus-powered crawlers to give you high-producing performance packages: 42 new Bulldozers, to fit your needs exactly . . . 4 new Drott Loaders, 1 to 3-cubic yard capacity . . . 4 new Superior® Pipe-Booms, 8 to 55-ton capacity; 3 job-proved PCU'S! . . . **Measure . . . compare . . . prove to yourself . . . new bonus-powered International crawler tractors beat anything else on tracks! Try this turnpike-paced new power for capacity, operator preference, profit potential. Ask your International Industrial Power Distributor for a bonus-powered demonstration to your specifications!**

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AGE INCLUDING: Crawler, Wheel, and Pipe-Boom ed Scrapers and Bottom-Dumps . . . Tractor and Diesel and Carbureted Engines . . . Motor Trucks.

Rugged, Efficient, Adaptable

JOHNSTON
Vertical
PUMPS

are ideal from every standpoint

Johnston Pump in use in a pressure sprinkling system for a California Park.

For nearly 50 years, Johnston Vertical Pumps have established an enviable record of dependability operating under widely varying conditions in nearly every section of the world. Scientific design, interchangeable parts, low maintenance and operating costs, starting and stopping easily without priming devices, and saving of up to 60% in floor space because of vertical design, are a few of the many advantages. Add to this, friendly, efficient dealer service everywhere and you have an unbeatable combination. Check with the dealer in your area or write for colorful bulletin.

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Here's the Equipment That Really **Stretches** Maintenance Budgets!

AIRPLACO® CONCRETE GUNNING EQUIPMENT

For maximum efficiency, speed and economy, public works officials are turning to the new AIRPLACO Portable Concrete Gunning Rig. From simple road, curb and street repairs to major concrete reconstruction projects on bridges, docks, sewers, reservoirs and many other structures, you can do the job faster and at far less cost with the AIRPLACO Rig.

The AIRPLACO Rig consists of the SAND-LOADER for rapid loading of sand; the MIX-ELVATOR* for automatic proportioning, continuous mixing, elevating and screening; and either the NUCRETOR* or BONDACTOR* for the actual application of the concrete. (The NUCRETOR or BONDACTOR is available separately.) The entire unit can be towed easily by your pick-up or compressor truck. No set up time required.

Investigate AIRPLACO concrete gunning equipment now.

Whatever Your Specific Requirements, There's an AIRPLACO Concrete Gun to Do the Job

AIRPLACO concrete gunning equipment is available in a wide range of sizes to fit your production and job requirements from ½ to 7 cubic yards of aggregate per hour, and using air compressors with 75 to 600 CFM capacity.

FREE Complete Line Catalog!

See your AIRPLACO distributor or write today for your complimentary catalog. Here are the answers to many of your questions about AIRPLACO equipment and job applications.

*Registered Trade Names

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MANUFACTURERS OF ADVANCED DESIGN CONCRETE GUNNING, MIXING AND PUMPING EQUIPMENT

DOCK and HARBOR REPAIRS

SEWER RESTORATION

SEE THE Forty Five BEFORE YOU BUY

Here's motor grader design that pays off in extra output on today's tougher, more precise jobs. You get these big advantages when you put the FORTY FIVE to work for you—more power at the wheels, more dirt at the blade, plus precision control and ease of operation.

Allis-Chalmers diesel engine with follow-through combustion provides real lugging ability . . . responds quickly to varying load conditions . . . has the power with tandem drive to pull through soft spots, roll big windrows, peel off that last inch of tough, hard dirt.

ROLL-AWAY moldboard reduces friction drag by rolling the load up and ahead of the blade edge . . . moves more dirt with less effort . . . makes more efficient use of engine power on sloping, rough grading, stripping and other heavy-duty construction and maintenance jobs.

Toggle-type controls give the operator finger-tip command of every blade position, every job. Exclusive mechanical toggle-type action provides a positive "feel," yet operation of moldboard components, scarifier and front wheel lean is accurate and easy.

Get a demonstration of the FORTY FIVE from your Allis-Chalmers dealer . . . let him show you how fully-enclosed power steering, accelerator-decelerator pedal, "box seat" comfort and visibility, and other features give you an extra measure of performance on all your grading jobs. Check the complete service program he offers you . . . factory-trained servicemen and True Original Parts for high-quality service, continued top performance and long equipment life.

Forty Five
120 brake hp
23,800 lb
6 forward speeds to 20.6 mph
3 reverse speeds to 7.0 mph

ALLIS-CHALMERS, CONSTRUCTION MACHINERY DIVISION, MILWAUKEE 1, WISCONSIN

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Thousands use our Readers' Service card to keep up to date . . . do you?

They choose TYLOX Flexible PIPE JOINTS

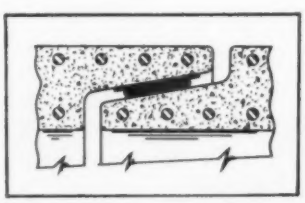
to assure

LEAK-PROOF, CORROSION-RESISTANT PIPE LINES

Thousands of Dublin citizens view this TYLOX-Jointed concrete pipe as it passes in review during a St. Patrick's Day Industrial Parade. Manufactured by Moracrete, Ltd., of Dublin, it is part of 53,000 feet of similar pipe required for the $6,000,000 North Dublin Drainage Scheme.

In designing the system, engineers knew that no ordinary pipe joint could last for long under the tough conditions involved. Its location along the coast meant the line would be subject to severe VIBRATION, SHEAR stress and CORROSION. In fact, there was only *one* pipe joint the engineers felt safe in specifying . . . TYLOX Rubber Joints.

TYLOX-Jointed pipe lines are giving trouble-free service under "tough" conditions, all over the world. That's why more and more waste disposal authorities are specifying "TYLOX" for their projects. Like the Dublin officials, they want to make sure their pipe joints are safe from failure, *whatever* the conditions.



Non-corrodable TYLOX Joints seal water-tight by compression, and outlast the pipe itself.

5010

WRITE FOR our new 20-page booklet "Joint Enterprise." Read the facts on TYLOX — and the case histories supporting the facts — and specify TYLOX Rubber Joints on your next pipe job.

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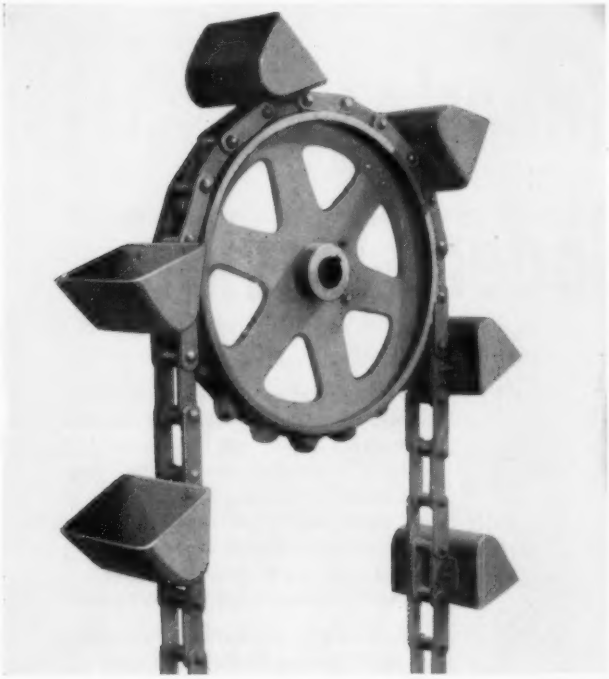

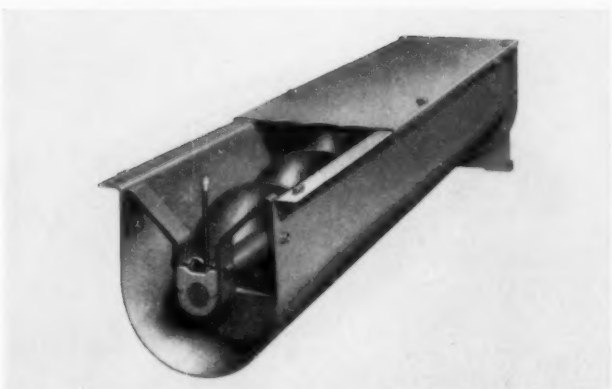

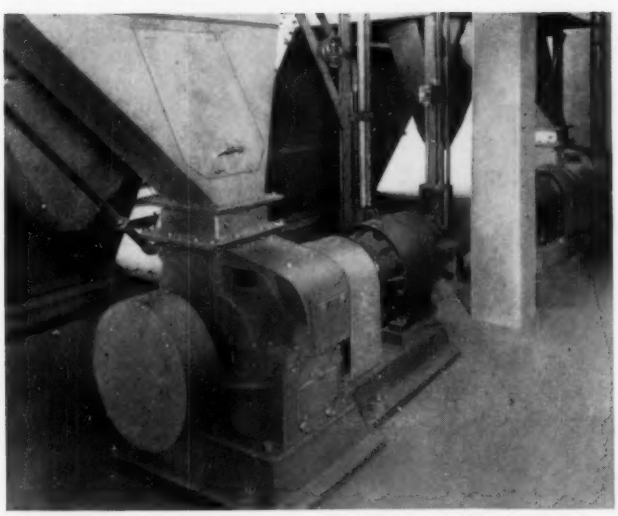

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Jeffrey combination chain (pictured here) offers excellent wear-and-shock-resistance for drives of moderate speed or for operation in gritty materials. All Jeffrey chain combines maximum strength with minimum weight, assuring long life and ability to withstand shocks and overloads.

Jeffrey's wide range of sprocket wheels meets most treatment plant requirements. Chainsaver sprockets add to the life of chains by distributing wear over wider areas.

Jeffrey malleable iron buckets are smooth, seamless and strong, affording clean delivery of materials.

Spiral conveyor and fittings from the complete Jeffrey line meet practically any requirement and operating condition. Modern manufacturing methods insure uniform strength and true alignment. They are interchangeable with other standard makes for replacement service. Catalog 851.

Screenings grinders provide a sanitary and satisfactory method of disposing of organic matter and miscellaneous materials caught on screens. Jeffrey grinders have many features which contribute to efficiency. Operating costs are low. Because of the long life of the cutters, maintenance is also unusually low. Catalog 833-A.

Replacement parts available from convenient distributor stock. The Jeffrey Manufacturing Company, Columbus 16, Ohio.

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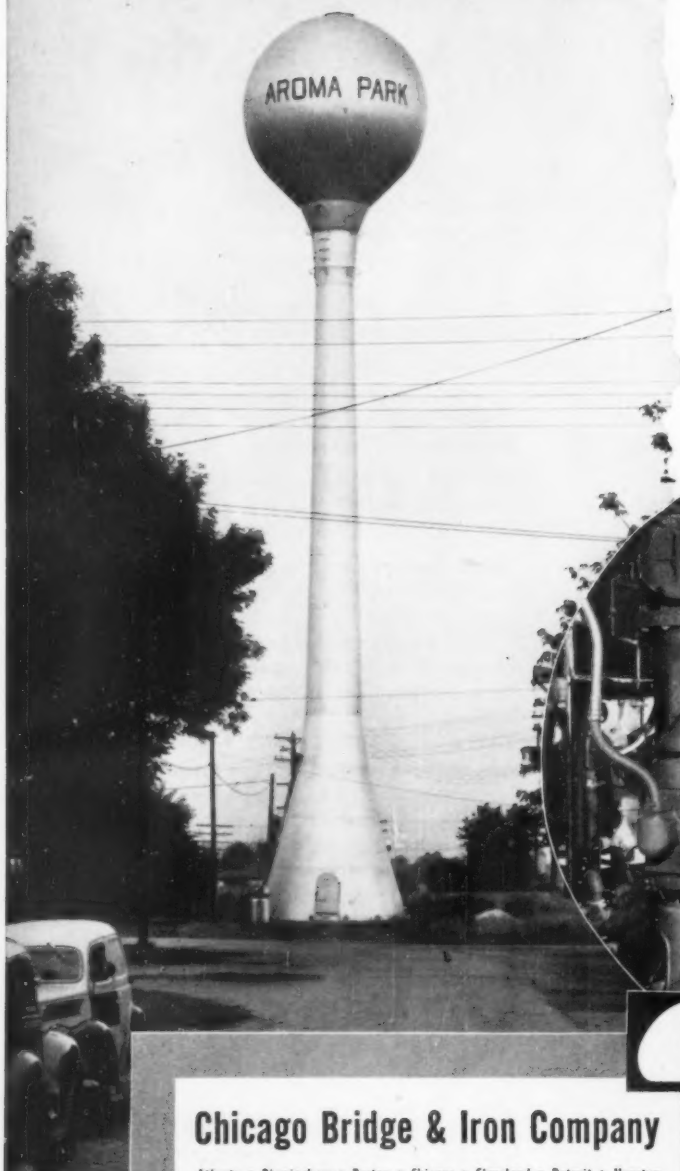
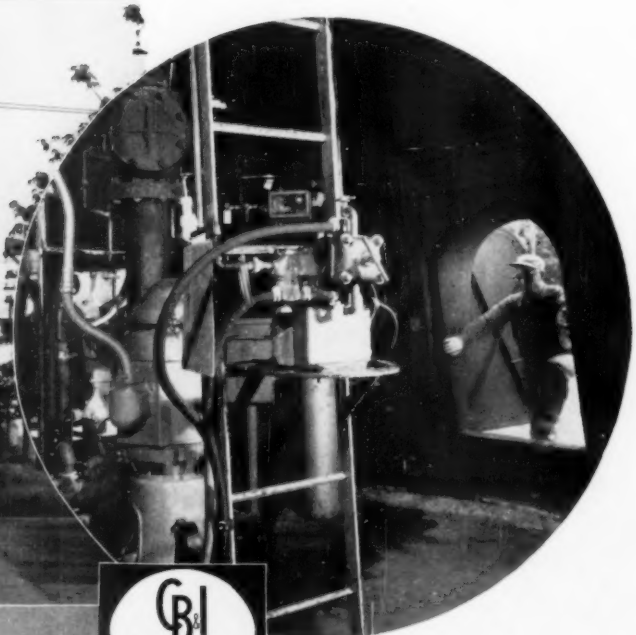


The pleasing symmetry of a Horton Watersphere® is fast becoming a symbol of progress, utility and good water service. Combining sound engineering principles with modern design they are providing private and municipal water systems with a dependable gravity pressure water supply for domestic, commercial or emergency use.

Waterspheres are built in capacities to 250,000 gallons. Write our nearest office for further information.



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Plants in
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Above left: 50,000-gal. Horton Watersphere at Aroma Park, Ill.

Above: Interior view of Watersphere's base showing its use for housing water treating and pumping equipment.

Now's the time to mail this month's Readers' Service Card.

FLEXIBLE ARMCO STEEL WATER PIPE

keeps maintenance costs down to earth

Armco Steel Water Pipe eliminates many trouble spots that may consume your maintenance dollars. Strong, ductile Armco Pipe withstands damage from water hammer, ground settlement, traffic pounding and many other forces that often cause leaks or cracks in rigid, brittle pipe.

Armco Pipe, supplied in long lengths, is easy to install, requires fewer joints where leakage may occur. Mechanical or welded joints can be made bottle-tight. Outside coatings are supplied to AWWA specifications and a spun enamel lining will prevent tuberculation.

The wide range of sizes of Armco Welded Steel Pipe makes it easy to match your water line requirements exactly. Diameters range from 6 to 36 inches, wall thicknesses from $\frac{9}{64}$- to $\frac{1}{2}$-inch. Write to us for more information. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 4476 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. Export: The Armco International Corporation.

Wherever water flows, steel pipes it best

ARMCO WELDED STEEL PIPE

ARMCO®

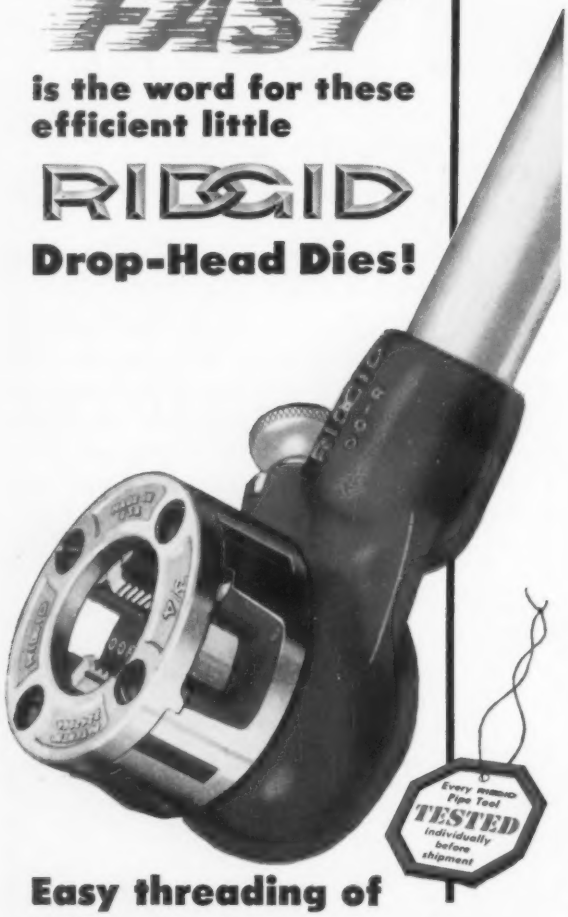
meets AWWA specifications

FAST

is the word for these efficient little

RIDGID

Drop-Head Dies!



Easy threading of 1/8" to 2" pipe or conduit

Snap size head you want into ratchet drive ring, from either side—it can't fall out. Dies reverse easily for close-to-wall threading. 00R and 0R, 1/8" to 1"; 111R and 11R, 1/8" to 1¼"; 12R, 1/8" to 2". Free carrier with sets. Conduit and special dies available. Real work-savers—at your Supply House!

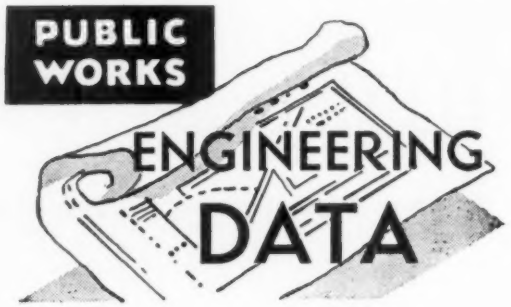
RIDGID Bolt Threaders, too—No. 00R-B, ¼" to 1", National coarse and fine thread, efficient drop-head dies.

"Threaded Pipe—It's Tight—It's Best—Costs Less"

RIDGID

Work-Saver Pipe Tools

The Ridge Tool Company, Elyria, Ohio, U. S. A.



Sewage Flow High in Los Angeles During Heavy Rains

During the storm of Jan. 26th, the sewers leading to the Hyperion Treatment Plant, Los Angeles, Calif., were very greatly overloaded and the total flow far exceeded the maximum capacity of the plant. Beginning at about noon on January 26th, the main sewers were completely filled—up to the manhole covers, at Tyburn Street near Fletcher Drive, at Overland Avenue near Northgate Street, and at the inlet to the Centinella siphon. It was realized that unless the pressure was relieved the sewage would overflow through the manholes into the streets and might rupture the North Outfall Sewer, discharging the entire volume of sewage onto the streets and flooding residential and industrial areas. The only means to prevent this was to by-pass the storm sewage. This was done by using the Valley Settling Basin to maximum capacity, discharging into the Los Angeles River at Aviation Drive and into Ballona Creek at Jackson Street, and directly into the ocean through the ocean outfall at Hyperion after chlorination, but without normal plant treatment. The peak flow of storm sewage is reported to have been at the rate of 497 mgd, or more than twice the designed capacity of the sewers and treatment plant, indicating the serious emergency which existed. Apparently no serious contamination of beach areas resulted, according to a careful survey.—Report of Los Angeles Board of Public Works.

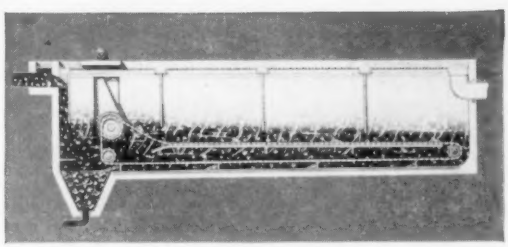
Shelter For The Night Along the Ohio Turnpike

Assistance to Ohio Turnpike travelers in finding overnight sleeping accommodations will be provided through the placement of special signs along the 241-mile toll highway and the distribution at turnpike toll plazas of pamphlets listing motels and hotels in the vicinity of interchanges. The program is expected to reduce the need for prolonged driving by tired or sleepy travelers in search of overnight shelter.

Two types of signs have been ordered by the Turnpike Commission for guidance to overnight lodgings. A large sign, 16 by 20 feet in size, will be placed three miles in advance of each interchange near which accommodations are available. It will bear the legend, "Motel Area—Next Exit—Inquire at Toll Plaza." A smaller sign, placed near the toll plaza, will direct travelers to the appropriate exit ramp leading toward the area of hotels and motels. The signs will be constructed of reflectorized aluminum, with gold letters on a rust colored background.

THE REX VERTI-FLO

works like magic in cutting high settling costs



The amazing ability of Rex Verti-Flo Clarifiers to reduce costs...assure clearer effluent...increase over-all plant efficiency... is almost magical. Actually the Verti-Flo design *divides* a horizontal-flow settling tank into a series of smaller, vertical-flow cells.

What does this unique design mean? It means more tank capacity—up to *four* times more than conventional settling tanks. In existing tanks, Verti-Flo will at least double your present capacity. In new construction, Verti-Flo® saves on both construction and equipment costs since you can plan for smaller tanks. Detention times are from one-fourth to one-half those required in conventional tanks and yet you get an effluent of maximum clarity.

Whether you specify equipment or operate a plant, you should know the facts about Rex Verti-Flo. Why not have the advantages of Rex® Verti-Flo in your plant? For complete details, mail the coupon today for your copy of Bulletin 52-77. You'll be happy you did.

These typical Verti-Flo users are getting increased efficiency...lower costs...clearer effluent

Water Treatment Plants

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Ashland, Oregon
Roseburg, Oregon
Kansas State Penitentiary, Lansing, Kansas
Corvallis, Oregon
Florence, Oregon
Valencia, Venezuela
Sweet Home, Oregon
Fort Wayne, Indiana
Belleview, Washington
Washington Water Power Co. Clarkston, Washington
Somerset, Pennsylvania
Federal Reformatory for Women Alderson, West Virginia

Waste Treatment Plants

Pentagon Building Arlington, Virginia
Kirkland, Washington

Industrial Waste Treatment Plants

Johns-Manville Corp. Finderne, New Jersey
Combined Locks Paper Co. Combined Locks, Wis.
Kohler Company Kohler, Wisconsin
Maynard Electric Steel Casting Company Milwaukee, Wisconsin
The Ruberoid Company Bound Brook, New Jersey
Wisconsin Car Wash Co. Milwaukee, Wisconsin

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It's Hot-Dip Galvanized

Here's a carload of spiral pipe on its way. Wherever it's installed, you can be sure of trouble-free service. That's something to consider with today's high costs of maintenance. It is estimated that corrosion is costing the United States over five billion dollars a year. By having your products Hot-Dip Galvanized you can greatly reduce these costs. Hot-Dip Galvanizing is more than just a coating, because with Hot-Dip Galvanizing the zinc actually becomes an alloy with the base metal. This means your products will last longer.

Whatever the product may be, if it's iron or steel, have it protected with Hot-Dip Galvanizing. For the best in galvanizing send your products to a member of the AMERICAN HOT DIP GALVANIZERS ASSOCIATION . . . . he has the know-how to give you a top quality job.

Send today for our new booklet "Stop Rust." It gives you the full story on the process, plus a comprehensive coating comparison chart. "Must It Rust" 16 mm film available for showing.

AMERICAN HOT-DIP GALVANIZERS ASSOCIATION

1506 FIRST NATIONAL BANK BLDG., PITTSBURGH 22, PA.

Future Water Needs and Plans for Dallas

If a contemplated water supply is achieved, the Dallas area, city and county, should have 565,000,000 gallons daily available in the year 2000, with an estimated consumption of 485,000,000 gals. This excess, however, is necessary because of runoff factors which vary from year to year, according to James A. Cotton, of Forrest and Cotton, Dallas consulting engineers who are making the studies. He reported, in a paper before the ASCE Dallas meeting, that Dallas County has a firm water supply of 164 mgd from the existing reservoirs on the Elm and East Forks of the Trinity River. Analysis of future growth indicated this supply must be increased to 485 mgd by the year 2000. Additional development of the Elm and East Forks, together with a proposed reservoir on the Sabine, would provide a total estimated supply of 565 mgd.

Mr. Cotton said that in 1953, with a city population of 539,800 and a county population of 716,700, the per capita water use was 140 gallons a day. Population growth was estimated with the aid of the Bureau of Business Research of the University of Texas, headed by Dr. John R. Stockton. It was indicated that in 2000 the city population would be 1,586,200 and that of the county 2,440,300. Consumption in 2000 is estimated to be 200 gpcd.

Salary Scales for Highway Engineers

State Highway Departments are having a hard time finding competent engineers to fill their ranks, though most states have attractive engineer-in-training programs to help the young engineering graduate. These programs are usually set up on a 4-year basis and after serving the required time with good standing the engineer is promoted to one of the many openings in the department.

To help promote jobs available and the salaries they pay, several states have given their engineers' salary schedules as stated below:

Florida State Road Department

Tallahassee, Florida

Engineer Trainee	$350-$450
Assistant Engineer I, Designer	$400-$500
Engineer I	$440-$525
Assistant Engineer II	$460-$575
Senior Designer	$480-$600
Engineer II, Resident Engineer	$500-$625
Assist. District Engr.; Asst. Engr. of Dept.	$600-$745
District Engr.; Engr. of Department	$655-$810
Assistant State Highway Engineer	$690-$833
Deputy State Highway Engineer	$750-$917
Executive Director, State Highway Engineer	$800-$1000

Ohio Department of Highways

Columbus, Ohio

Engineer—In-Training I	$360-$440
Engineer—In-Training II	$400-$480
Engineer—In-Training III	$440-$525
Civil Engineer I	$360-$440
Civil Engineer II	$400-$480
Civil Engineer III	$440-$525
Civil Engineer IV	$480-$575
Civil Engineer V	$525-$630
Civil Engineer VI	$575-$690
Civil Engineer VII	$630-$750
Civil Engineer VIII	$690-$820
Civil Engineer IX	$750-$900
Civil Engineer X	$820-$980

Missouri State Highway Commission
Jefferson City, Missouri

Engineer Trainee	$401-$464
Engineer Inspector I	$335-$425
Engineer Inspector II	$413-$478
Engineer Inspector III	$464-$522
Resident Engineer I	$507-$605
Resident Engineer II	$538-$623
Senior Engineer I	$478-$554
Senior Engineer II	$522-$623
Senior Engineer III	$623-$681
Designer I	$345-$464
Designer II	$478-$605
Bridge Designer	$464-$623
District Engineer Assistant	$571-$661
Assistant Division Chief	$642-$700
District Engineer	$800-$825
Division Chief	$850-$875

California Department of Public Works
Sacramento, California

Junior Civil Engineer	$395-$436
Assistant Highway and Bridge Engineer	$436-$530
Associate Highway & Bridge Engineer	$530-$644
Senior Highway and Bridge Engineer	$644-$782
Supervising Highway & Bridge Engineer	$745-$905
Principal Highway and Bridge Engineer	$950-$1050
Assistant State Highway Engineer	$1050-$1150
Deputy State Highway Engineer	$1150-$1250
State Highway Engineer	$1250-$1350

New York Department of Public Works
Albany, New York

Junior Civil Engineer	$362-$455
Assistant Civil Engineer	$447-$553
Senior Civil Engineer	$549-$672
Associate Civil Engineer	$674-$817
Principal Civil Engineer	$829-$993
Deputy Chief Engineer	$1131-$1333

Multi-Million Gallon Industrial Water Installation

A river intake system for the new Tide Water Associated Oil refinery, 15 miles south of Wilmington, Delaware, will require movement of large volumes of water from the Delaware River to the processing area. Initially, nine Byron Jackson two-stage vertical pumps will be installed, with provision for future installation of three more units. Each of the nine pumps will be driven by a vertical 2000-hp electric motor at 600 rpm and will deliver 34,000 gallons of water per minute at 184 feet total head. The pumps will discharge into two reinforced concrete lines 78 inches in diameter which extend about 5000 feet to the beginning of the distribution system for the refinery.

All engineering involving the pumps and movement of the water from the Delaware River to the refinery distribution point was done on the West Coast. In the Byron Jackson Los Angeles Hydraulic Laboratory a model tank (along with nine model pumps) was constructed that duplicated the actual field operation. In this manner it was possible to make tests which included analyses of water flow, swirling, effect of opening or closing entrance gates, possible concrete cavitation, permissible minimum water level, effects of high tide and arrangement of intake gates and screens. Because of the brackish salt water to be handled, impellers, pump cases, shafts and columns are of stainless steel.

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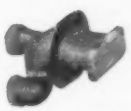
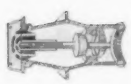
Regardless of the type of pool you build you can maintain the highest standards of sanitation and hygiene by installing Josam Swimming Pool Fittings. They keep pool water in the safest condition by providing a continuous supply of clean water through proper circulation and drainage. Operators of public and private pools everywhere highly recommend Josam equipped pools because of a long-standing record for top-level cleanliness and safety.

for RECIRCULATING SYSTEM POOLS



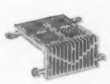
Series No. 0700-B Injector Supply Fitting



Series No. 0730-B Supply Fitting and Control Valve

Series No. 0380 Main Outlet Drain

for WATER LEVEL DECK POOLS



Type No. 0297-B Skimmer Grill and Access Grate

Series No. 0298 Skimmer Fitting with Flow Control

Type No. 0291-B Deck Trench Grate

Get your free copy of Josam Manual SP-5. In it you will find typical plans and layouts of pools, showing supply fittings, gutter drains, overflows, outlets, vacuum connections, hair and sediment interceptors and other necessary fittings to meet every requirement and every condition. If you are building or remodeling, send coupon today; Manual SP-5 is the "Authority" on Swimming Pool Circulation and Drainage.

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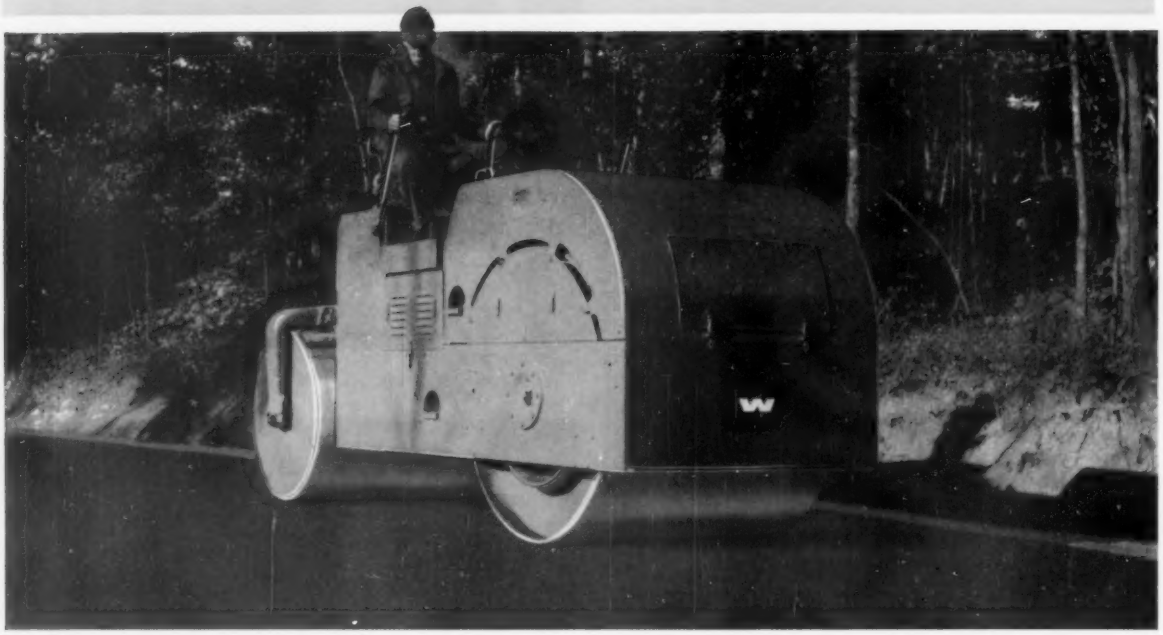
NOW HUBER-WARCO TANDEMS OFFER torque converter 2-speed transmission



Two new important features added to Huber-Warco medium and large sized tandem rollers are: a torque converter and a two-speed transmission.

The torque converter offers all of the advantages of a fluid coupling, with these important plus features: (a) available power is doubled, (b) the roller maintains approximate rolling speed regardless of grades encountered, and (c) fuel consumption is reduced.

Advantages of the two-speed transmission are: (a) at slow rolling speeds, the use of low gear maintains sufficient RPMs at tailshaft to keep governor effective, (b) makes correct gear ratio available to meet any work load or desired rolling speed, thus reducing strain on converter and engine, and (c) allows the engine to maintain sufficient RPMs to provide hydraulic pressure for fast steering at low rolling speeds.

Other important Huber-Warco features include: the exclusive guide roll assembly that will not "scuff" (factory perfect adjustment for the life of the roller); full hydraulic steering with variable speed adjustment; two braking systems; dual controls; close curb clearance and many other features that make the Huber-Warco tandem line outstanding.

Huber-Warco medium and large sized tandems are gasoline and diesel powered and are available in 5-8, 8-10, 8-12 and 10-14 ton models. A 3-5 ton tandem with water cooled engine and torque converter as standard equipment, is also available.

Write for specifications.

For a demonstration — see your nearest Huber-Warco distributor

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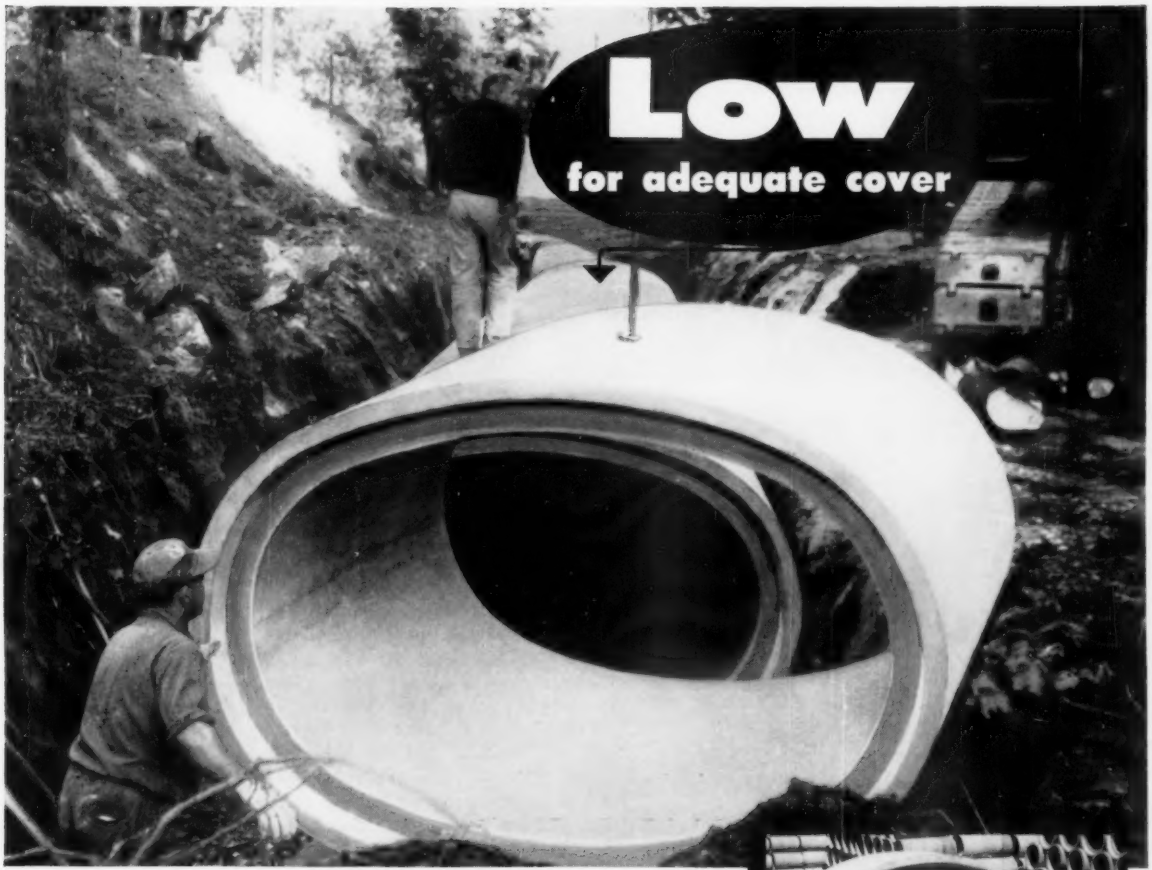

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Elliptical LO-HED Pipe carries a greater flow than its round equivalent—in a minimum depth of cut with increased depth of cover. LO-HED Pipe is easier to lay, to grade and line. Smooth walls and tight joints insure maximum hydraulic capacity, with a minimum build-up of debris in the invert, even under low-flow conditions. Furnished in pre-tested strengths to answer any low headroom problem, including culverts under highways and railroads.

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AND WITH THE NEW HOMELITE FLOATING POWER, you'll find handling ease you never knew before. The all-angle, any-position carburetor gives you full power cutting — whether you're felling, bucking, notching, limbing or under-cutting.

Floating Power lets you cut with less effort, less fatigue than any other chain saw. Because the Homelite EZ weighs only 19 pounds you can carry it anywhere. Its full 5 horsepower cuts through 8″ Oak in 5 seconds and 18″ Pine in 14 seconds. And the three bar sizes — 17″, 21″ and 25″ will handle trees up to 3 feet in diameter.

The EZ brings you Homelite dependability at a new low cost — not just a low initial cost, but also lower maintenance and operating costs than any other direct-drive chain saw.

See this new floating power now! Try it and you'll know why the Homelite EZ offers easier cutting, faster cutting, more profitable cutting for your dollar.

Ask your Homelite dealer for a free demonstration. Also ask about the convenient time payment plan.

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Win a Homelite

24 Homelite EZ chain saws being given away each month. Nothing to buy. Nothing to write. No obligation. Just ask your dealer how you can win. See him today!

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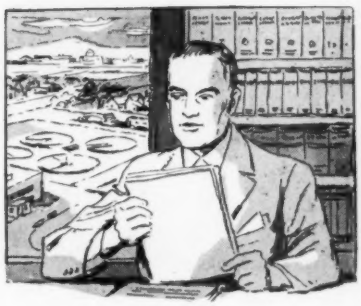

MELVIN NORD,
Dr. Eng. Sci., LL. B.
Registered Professional Engineer

Urban Redevelopment Laws

In *Velishka v. City of Nashua,* 106 Atl. (2d) 571, a New Hampshire case decided July 1, 1954, the constitutionality of a statute providing for the redevelopment of blighted areas was attacked.

The statute empowered the Housing Authority to condemn blighted areas, clear the land, and sell or lease the cleared land to private persons subject to conditions consistent with the redevelopment plan at the land's "use value". The constitutionality of the statute was attacked on three grounds.

(1) The plaintiff's property was not in itself "blighted property", although it was admittedly in a blighted area. Therefore, his property should not be taken from him by eminent domain. As to this, the court held squarely that it is unnecessary for each individual piece of property in an area to be blighted in order to subject it to condemnation, so long as the area as a whole is a blighted area.

(2) It was also contended that no specific directions are given to the Housing Authority for determining which areas are blighted, thus constituting an improper delegation of its powers by the legislature to the Housing Authority. The court held that the statute gave whatever directions it could, and that the very nature of the subject matter made it necessary to give broad discretionary powers to the Housing Authority.

(3) It was finally contended that the fact that the cleared land could be sold at a "use value" which was less than the cost to the City of acquiring and clearing the land, amounted to an unauthorized gift to the purchasers of such land. The court held, however, that there was nothing wrong in such a sale, so long as the purchaser paid the fair "use value" and was bound by conditions requiring him to use the land in a manner consistent with the redevelopment plan.

The constitutionality of the statute was therefore upheld.

As pointed out in an annotation in 44 A.L.R. 1414, redevelopment acts are now in effect in more than half the American Jurisdictions and in the overwhelming majority of cases their constitutionality has been upheld.

Public Walks

In *Nicholson v. City of Des Moines,* 60 N. W. (2d) 240, an Iowa case decided Sept. 22, 1953, the issue was the liability of a municipality for injuries to a pedestrian who falls from a public walk into an adjacent unguarded pit.

At 11:30 on the night of March 25, 1952, Winfred Vincent, aged seventy-two, was seen walking toward the bridge spanning Four Mile Creek in the City of Des Moines. A light snow was falling that night, and it was very dark. The next morning Vincent's body was found at the bottom of a pit about twelve feet away from the public walk. The coroner testified that Vincent had died by falling into the pit.

Vincent was last seen alive after leaving a bus terminal three blocks from the bridge. He had frequently walked these three blocks, crossed the bridge, and walked several blocks further to his home.

The present bridge is located a few feet south of the location of the original bridge. Originally, a cement sidewalk led straight across the bridge, but when the new bridge was built in 1944, the City built a cinder path curving southward to connect with the sidewalk on the new bridge. The cinder path was about six or eight feet wide, rough and somewhat irregular and without definite margins.

The pit into which Vincent had fallen was in the west bank of the creek, about twelve feet away from the cinder path, and in a direct line from it, provided one did not manipulate

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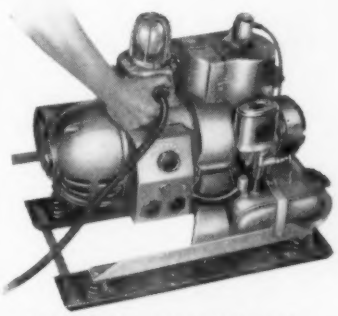

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Complete line of saws with clearing and brushcutter attachments for every woodcutting job.

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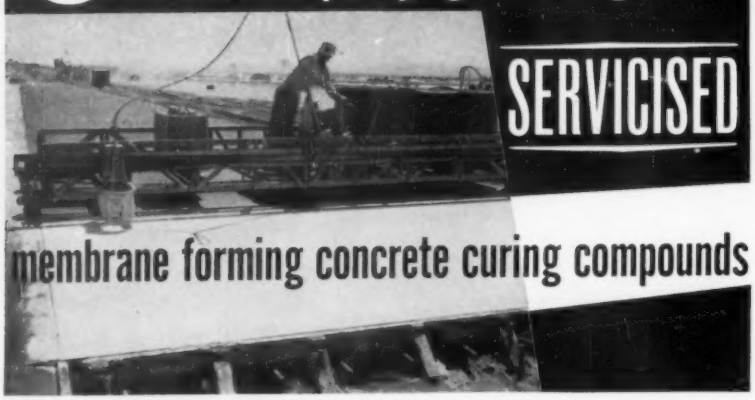
6 reasons for specifying and using SERVICISED membrane forming concrete curing compounds



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WHITE PIGMENTED TYPE Servicised White Pigmented Curing Compound provides a film or membrane capable of reflecting heat. It is widely used in areas where atmospheric temperatures exceed 80°F., and properly applied, will reduce concrete temperatures approximately 15°F. Excessively high temperatures during the early hardening period tend to jeopardize setting of concrete and reduces its final strength. High quality inert pigments added to the basic compound also prevent too thin or uneven coverage, as improper application is readily seen. Used on all U. S. Engineers work.

CLEAR TYPE Servicised Clear Curing Compounds are available in both Wax-Resin and Resin Base Types. Only pure synthetic resins are used with carefully controlled proportions of oils and waxes, etc., in a petroleum solvent to insure a clear, impermeable membrane. Both types can be supplied with a fugitive dye which materially assists in securing proper coverage, and which disappears after application.

WAX-RESIN BASE. A general purpose compound, usually used on mass concrete, pavements. Has excellent water retention properties, allowing slow curing of the concrete which eliminates checking. Dries rapidly and forms a film of uniform texture.

RESIN BASE. Recommended for buildings, offices, architectural concrete, etc. The pure resins, oils and other ingredients present a clear film which does not materially alter the appearance of concrete and it permits early application of adhesives, paint, etc.

AIR ENTRAINING AGENT Servicised Air Entraining Agent is a highly active, homogenous and clear solution. A relatively small quantity produces maximum air dispersion, yet it is not so critical as to create wide fluctuations in the amount of entrained air should slight variations in the amount used occur. It will not settle out in storage or gum the dispenser, and its action is not jeopardized by the presence of Calcium Chloride. Servicised Air Entraining Agent meets all official specifications, comes ready to use and requires no additional ingredients or treatment before being used. Available in 5 gallon and 55 gallon drums.

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the curve in the path. The pit had been formed by the washing away of the soil by the discharge of water from an eighteen-inch pipe installed by the City to carry surface water from a ditch on the side of the cinder path. This drain pipe passed underneath the cinder path and through the west bank of the creek. The washing away of soil by the water discharged by the pipe had caused the pit to encroach on the west bank of the creek, and a section of the drain pipe had become exposed and unsupported and had fallen into the pit. This disconnected section, several feet long, had been lying at the bottom of the pit for several years. The walls of the pit were precipitous. Its depth was 10 to 15 feet, and its width about eight feet. There was no barrier guarding the pit, no street light in the vicinity, and the path was obscured by snow.

Vincent's administrator sued the City for negligence in maintaining the public walk. In the lower court, the judge directed a verdict for the City holding that a pit twelve feet from the public walk was not a part of the public street or highway and that there was therefore no duty on the part of the City to maintain barriers guarding the pit.

On appeal, this decision was reversed. The appellate court said that there is no specific distance away from a public street or highway (the sidewalk being regarded legally as a part of the street) beyond which the City's liability stops. So long as the hazard is one which is intimately connected with travel along the public path, the City continues liable for negligence. There was no showing that this particular hazard was unconnected with travel along the public path, and therefore it was erroneous to withhold the case from the jury. The appellate court therefore ordered a new trial, with instructions that the case be submitted to a jury.

The general situation involved in this case is fully discussed in an annotation in 44 A.L.R. (2d) 633. In general, other courts have taken the same position as the appellate court in Iowa took in the present case. The only exception to the rule is where the City has no legal power to guard against the hazard, e.g. where a railroad right of way interferes.

Injunction for Nuisance

It is a well known principle of law that in an action at law for damages arising out of a nuisance, it is not possible to join in a single suit two separate parties between whom there is no concert of action,

FITCHBURG CHIPPERS cut Brush Disposal Costs 25-50%

Read how Bridgeton, N. J. solved the problem left by Hurricane Hazel — 1000 trees down!

The Park and Shade Tree Commissions
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June 10, 1955

Fitchburg Engineering Corporation
Fitchburg, Massachusetts

Gentlemen:

The City of Bridgeton has an 1100-acre park, complete with zoo, a raceway, two lakes and a large rhododendron grove.

Hurricane Hazel left our park practically devastated, with a thousand trees down. Our white pine grove was ruined and our picnic areas were a shambles.

Our City Council authorized the purchase of a Model C-612 Fitchburg Chipper, because we were getting nowhere removing the brush from the park.

Since we've had the Chipper we find we can easily chip 8 or 9 truckloads of brush into one dump truck. We've stockpiled the chips and we find that they're in great demand by gardeners and nurserymen, so there's no trouble getting rid of them.

Another thing — because of the feed plate with its safety spring the men can't get hurt by any backthrow from the Chipper.

We save the labor of two men with our Fitchburg Chipper and we have saved several months' time in cleaning up after Hazel. Our Chipper is in frequent use either by us or by the Department of Streets and Roads to remove brush and fallen trees both in the park and along the streets.

Yours truly,
Howard L. Gandy
HOWARD L. GANDY
Superintendent

HLG/sv

FITCHBURG ENGINEERING CORPORATION
FITCHBURG, MASSACHUSETTS

When you want to cut brush disposal costs, investigate a Fitchburg Chipper. There is a model to fit your specific needs.

City after city is saving many manhours and heavy trucking expense—cutting disposal costs 25-50% with these rugged, well-engineered machines. Only Fitchburg Chippers have the patented Safety Spring action which provides equal ease in chipping all sizes of wood to the machine's rated capacity.

Mahwah, N. J. saves 3 men

"Our Fitchburg Chipper was purchased in May 1954. It will take only a short time to pay for itself. We hired 6 men to cut and clean up brush. Now with the Fitchburg Chipper we only need 3 to do the same work. All brush is cut and chipped the same day. This eliminated unsightly heaps along the roadside. In wooded areas the chips are blown back along the roadsides and serve as mulch for forage."

Hartford, Conn. saves manpower-trucking costs

BRUSH DISPOSAL: "Our Highway Division has used our Fitchburg Chipper to clean up the brush and branches along newly developed road areas. By chipping brush, the city saves in use of both manpower and trucking costs." ROAD CLEARANCE: "If we get hit again by hurricanes or bad wind storms, we now have an excellent piece of equipment that will enable us to readily open up the streets for emergency traffic by reducing the fallen branches to chips."

A word about Sealed Bids—

Know what you are buying! Bids on Fitchburg Chippers are made on a complete machine ready to operate—NOT a stripped-down model with extra costs to come later. Bids will also be made according to the work capacity of the machine as needed for your specific requirements. Price, alone, is often misleading under the sealed bid system.

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Send my Free Chipper Booklet giving specifications, operating data, explanation of exclusive Fitchburg Safety Spring, actual letters from users.

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each one committing independent acts constituting private nuisances.

Nevertheless, in *Vaughn v. Burnette*, 211 Ga. 206; 84 S.E. (2nd) 568, decided Nov. 9, 1954, in an action in equity to enjoin the City of Dalton and two private persons from independently committing a nuisance by the ponding of waters on Vaughn's lot, thereby damaging her real and personal property, the joinder of parties was held to be proper. Furthermore, it was held that she could also obtain damages, apportioned among the three defendants, in the same action.

The explanation of the case is that the rule cited above as to joinder of parties applies only to actions *at law* and *not* to actions *in equity*. In equity, the court takes jurisdiction over such cases in order to avoid multiplicity of suits. Further, when a bona fide case for injunctive relief is made out, the equity court has discretion to go further and give complete relief in the same action, through a decree for damages apportioned suitably among the defendants.

The case is commented on in 45 A.L.R. 1281, where it is shown that this is accepted as a virtually universal rule.

BOOKS IN BRIEF

ABATEMENT OF HIGHWAY NOISE AND FUMES

The three papers in this bulletin discuss methods for detecting and evaluating noise factors and suggest various practical means for traffic noise abatement. Also reported are some preliminary studies on the problem of eliminating toxic gases and unpleasant exhaust fumes. Copies are 90¢ from the Highway Research Board of the National Academy of Sciences, National Research Council, 2101 Constitution, Washington, D. C.

FACTORS RELATED TO FROST ACTIONS IN SOILS

The papers of this bulletin present the following: (1) a terminology now in general use by those most actively studying the problems relating to soil freezing; (2) a discussion of climate and its relation to frost action; (3) detail data on subgrade moisture under different subgrade conditions, the variation in soil moisture varying with changing climatic conditions; (4) a correlation of means for predicting depth of frost penetration with actual meas-

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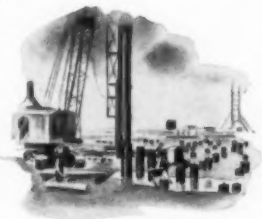
Highway Lighting Poles

Floodlighting Poles

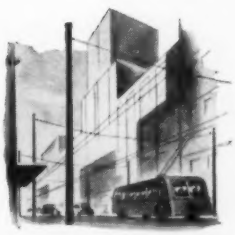


Foundation Piles

Sign Poles

Antenna Poles

Overhead Sign Supports



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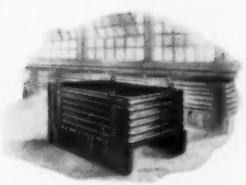

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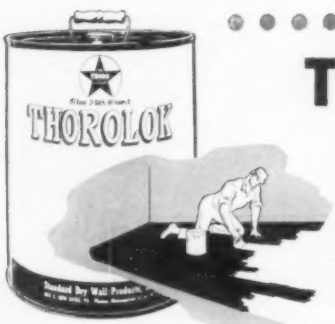

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urements; (5) a discussion of a means for measurement of reduced subgrade strengths which follow thawing of frozen soil ; (6) a means for better appreciation of agronomic soil groups as they are affected by frost action; and (7) a theoretical basis for frost-action research. Copies from the Highway Research Board of the National Academy of Sciences, National Research Council, 2101 Constitution, Washington, D. C. Price per copy $2.25.

CONFERENCE ON SANITARY ENGINEERING

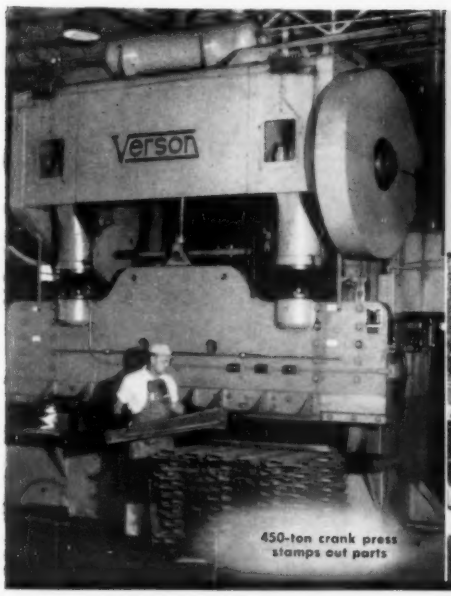
There were four subjects covered at the Fifth Annual Conference on Sanitary Engineering at Lawrence, Kansas. These were (1) the water resources of Kansas; (2) the effect of the 1952-1954 drought on the design of water supply impounding reservoirs; (3) the biological oxidation of organic wastes; and (4) the critical evaluation of recent trends and new developments in accelerated sludge digestion. Copies may be had from the University of Kansas Publications, Bulletin of Engineering and Architecture No. 34, Lawrence, Kansas.

UNGRADED AGGREGATES IN BITUMINOUS MIXES

This bulletin contains a paper presented at the 1955 Meeting of the Highway Research Board, "Mortar Theory for Use of Ungraded Aggregates in Bituminous Mixes," by Ladis H. Csanyi and Hon-Pong Fung. Their theory, stated briefly, is that the formation of thin films of bitumen on the minute particles of mineral dust forms a bituminous mortar binding ungraded aggregates together into a bituminous mixture suitable for paving purposes. The validity of the theory was tested on mixtures using such mineral fillers as limestone dust, pulverized loess containing 40 percent clay, and flyash. Various combinations of these materials were tested in the laboratory and a test road laid for field observation. A list of references and an appendix on "Measurement of Film Thickness of Bituminous Binders on Coarse Aggregate" are included. Price, $0.90; 52 pages. Request Bulletin 109 from Highway Research Board, 2101 Constitution, Washington, D. C.

SUPPLEMENTAL BROCHURE

A supplemental brochure has been prepared by Albright & Friel, Inc., to give the latest information on their professional record during the five years since 1950. Albright & Friel, Inc., 3 Penn Center Plaza, Philadelphia 2, Pa.



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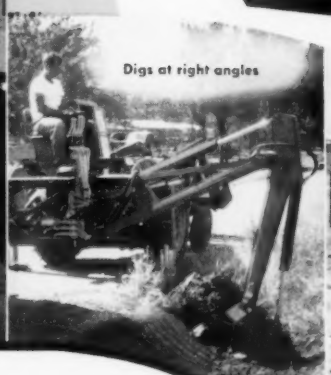
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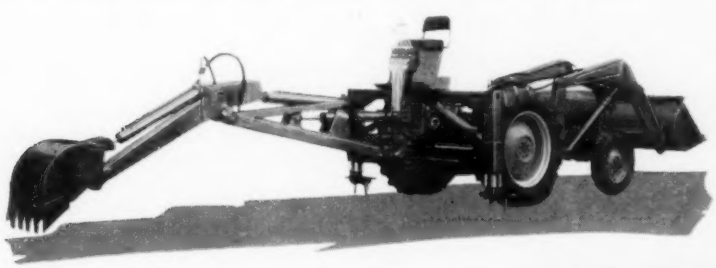

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SNUG TO THE WALL of a railroad underpass is the trench being dug by this compact Cleveland "Baby Digger." Its ability to put the edge of a trench within less than two feet of a parallel wall is but one of this Cleveland's many practical operating advantages.

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AMERICAN STANDARDS IN THE ELECTRICAL FIELD

"The 400 American Standards in the Electrical Field" is the title of a booklet which indexes and describes each American Standard in the electrical engineering area. It is designed to help the user and prospective purchaser to find the applicable standard on the product in which he is interested. 60 pages. Copies free from American Standards Association, 70 East 45th St., New York 17, N. Y.

DIRECT UTILIZATION OF WASTE WATERS

A survey, conducted for the California State Water Pollution Control Board, has found that various industrial plants have utilized waste waters for cooling and other plant processes. In arid regions, the reclamation of waste waters for parks, golf courses, etc., has been feasible. In many instances a sewage farm may provide secondary treatment economically or even given a monetary return. This survey of present day practices of waste water reclamation and utilization was made by the Engineering Center of the University of Southern California, Los Angeles, under the direction of Professor Robert C. Merz. A considerable portion of the report covers a review of both foreign and domestic operations where utilization of waste waters is taking place and how accomplished. State Board Publication No. 12, "A Survey of Direct Utilization of Waste Waters." Copies free from State Water Pollution Control Board, Sacramento 14, Calif.

CONSTRUCTION PLANNING, EQUIPMENT, AND METHODS

There are four aims of this book: 1) to provide text material concerning construction for students in engineering architecture and related fields; 2) to provide for professional men in the construction industry a help in planning construction projects; 3) to provide for professional engineers and architects a guide for use in designing projects and writing specifications in such a manner as to permit the use of the most satisfactory and economical construction methods; and 4) to provide a basis for analyzing the performance, cost and suitability of various types of construction equipment. Illustrative examples, tables, illustrations and problems are generously supplied throughout. Author is R. L. Peurifoy, Professor of Construction Engineering, Agricultural and Mechanical College of Texas. McGraw-Hill Book Co., Publisher. Price $8.50.

Over 200,000,000 feet of Orangeburg Pipe are in service today from Maine to California. Its recorded use in sewage disposal work dates back to 1906.

Orangeburg's root-proof joints and its resistance to corrosion make the pipe particularly adaptable for house sewers and other underground non-pressure uses.

Through its record in actual service, Orangeburg has gained acceptance by leading approving authorities, architects, engineers, plumbers and builders.

Outstanding quality is the big reason. Orangeburg is strong, tough, resilient... withstands traffic tensions...temperature changes. Resists acids and alkalies in ground waters and sewage wastes... lasts for years underground.

Orangeburg makes quick work of installation. Light 8-foot lengths are easy to handle. Taperweld Joints seal root-proof without cement or compounds.

Orangeburg also comes *Perforated* for foundation drains, septic tank filter fields ... all subsurface seepage drainage.

Easy to Install
No Cement — No Caulking
No Compound

The famous Orangeburg Taperweld joint seals root-proof and watertight with a few hammer taps. Long, 8-foot lengths are light, easy to handle, to grade, to install. Orangeburg saves trouble and money. Complete line of fittings simplify installation.

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The city of Abilene, Texas, has solved its garbage disposal problem with a CAT* No. 6 Traxcavator—a one-man machine that clears land, digs trenches and compacts and covers sixty 14-yard loads of trash and garbage every day.

E. L. Gann, Assistant Superintendent of the Abilene Sanitary Department, tells the story this way: "We saw a motion picture on sanitary landfill, got interested and asked for a demonstration. After seeing the No. 6 work we bought it on the spot—never moved it away from the demonstration site. It's been working ten months, doing a good job."

Abilene uses its No. 6 efficiently, covering the refuse with fresh dirt taken from the new trench which it digs on the same pass. The acreage for landfill was useless lowland, bought at a cheap price. After filling and raising, it will be used for industrial sites—a double gain for the city. For clearing brush from additional land, the bucket can be removed from the No. 6 and a bulldozer attached in only 20 minutes.

Today the new No. 977 Traxcavator replaces the No. 6 in the Caterpillar line. Its 96-inch, 2¼-yard bucket has a full 40-degree tip-back at ground level to hold the load. And a lift of 11½ feet provides ample dumping height. Fast, one-hand operation of bucket controls with automatic kickout and bucket positioner speed up cycle time. Comfort and visibility are given by the high, well-cushioned seat.

Ask your Caterpillar Dealer to show *you* his landfill motion picture or give you an on-the-job demonstration. He'll be glad to do both.

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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PUBLIC WORKS MAGAZINE

Volume 87, No. 4 April, 1956

STANDARDIZATION

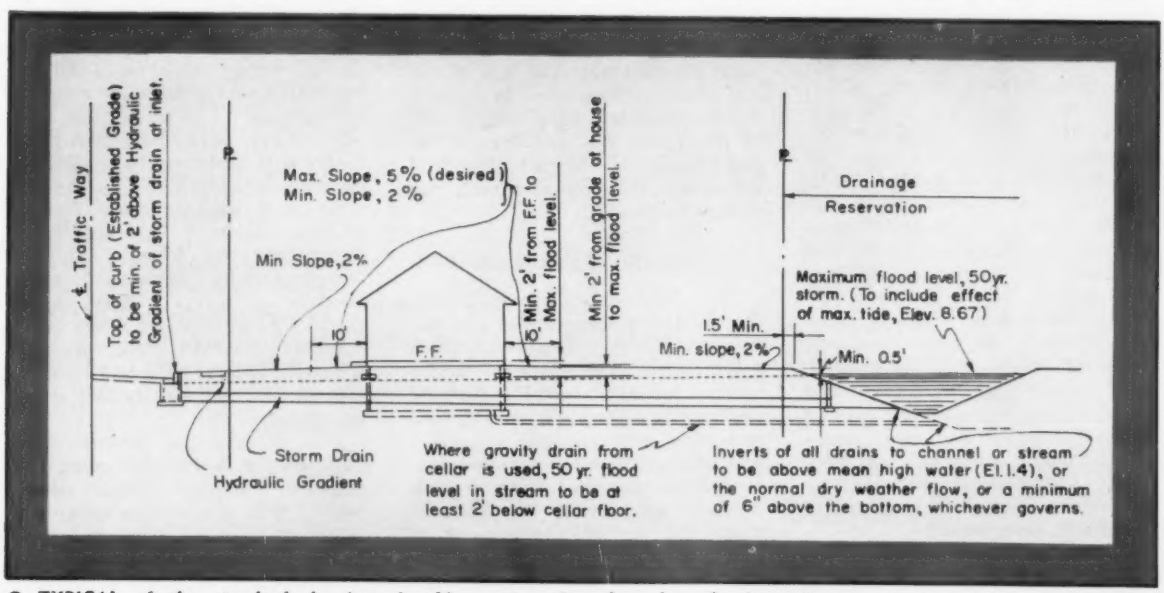
of Utility Design Procedures

A. R. VOLLMER,
Partner, and
J. G. PEELER, Jr.,
Engineer,
Whitman, Requardt and Associates
Baltimore, Maryland

STANDARDIZATION, in this century, has been responsible for many of the advances that have been achieved in the production of food, clothing, appliances and other items too numerous to mention. The study of production lines, though these are not normally applicable to utility construction, can be of benefit in both inititial cost, repair, and maintenance.

Standard details have long been a part of the design procedure for sewers, water mains and other utilities; but, in most cases, the application of these standard details has been confined to the most repetitious of items such as sewer and water house connections, meter settings, valve vaults, anchors, buttresses and similar items, The rapid development of the suburban areas since World War II and the rapid rise in population, which foretells a continued need for new homes in the suburban areas, has brought about a need for greater standardization than ever before; and this standardization is one of the means by which public works departments may be able to provide more service at less construction cost, with the expectation of lower maintenance and repair cost due to standard construction. The characteristic of rapid suburban growth has been apparent in all sections of the country, and the experience of one locality may be of value to many others. Baltimore County has "done something" to increase the scope of standardization and it is expected that the coming years will show a resulting benefit to the County, the design engineers, the developers, and the individuals.

Baltimore County comprises a land area of 607 square miles. Within the boundaries of the County there is an area known as the Metropolitan District, the residents of which can be served with water and sewerage facilities. The Metropolitan District as originally


℄ Traffic Way
Top of curb (Established Grade) to be min. of 2' above Hydraulic Gradient of storm drain at inlet.
P
Max. Slope, 5% (desired)
Min. Slope, 2%
Min Slope, 2%
10'
F.F.
Min. 2' from F.F. to Max. flood level.
10'
Min 2' from grade at house to max. flood level.
P
Drainage Reservation
Maximum flood level, 50yr. storm. (To include effect of max. tide, Elev. 8.67)
1.5' Min.
Min. slope, 2%
Min. 0.5'
Storm Drain
Hydraulic Gradient
Where gravity drain from cellar is used, 50 yr. flood level in stream to be at least 2' below cellar floor.
Inverts of all drains to channel or stream to be above mean high water (El. 1.4), or the normal dry weather flow, or a minimum of 6" above the bottom, whichever governs.

● **TYPICAL of the standard drawings is this section through a lot, showing minimum storm drainage requirements.**

designated in 1924 contained approximately 234 square miles. Since the creation of the District, the boundaries have been extended on several occasions owing to residential and industrial growth so that today the area comprises 254 square miles. The population of Baltimore County increased 260 percent in the years between 1920 and 1950, with the greatest increase occurring during the decade 1940 to 1950. The population of Baltimore County (excluding Baltimore City) was 270,000 in 1950.

During the years prior to World War II, and for a short time thereafter, the County Commissioners of Baltimore County were able adequately to furnish the populace utility services with a minimum of engineering personnel. The engineering staff was divided into two groups —those who designed sewer and water for construction within the Metropolitan District, and those who designed roads and storm drains for the entire County. Since the work of providing engineering services for the residents of the County was confined primarily to these two relatively small groups, design criteria and standard construction details could be carried from job to job with a minimum amount of explanation to the designers and construction personnel. In view of this arrangement, few, if any, written standards and details were required.

By 1948, the post-war building boom was greatly in evidence in Baltimore County. Plans and specifications were being prepared in ever-increasing numbers by the County and by consulting engineers for the utilities required for new subdivisions. The engineering organization of the County, which heretofore had proven to be adequate, now required greater coordination. It was at this stage that the Department of Public Works coordinated the work of the Metropolitan District, the Roads Department, the Buildings and Zoning offices and the Sanitation Division. The number of design personnel was increased in an effort to satisfy the demand. In order to standardize the design of all the projects being prepared by the County and by consulting engineers relative to new subdivisions and other projects, a "design standard" was prepared. This design standard provided only general design criteria and construction details.

During the period between 1948 and the present date, the County has been processing plans and specifications for construction projects prepared by their own design section and consulting engineers amounting to 15 to 20 million dollars per year. A sizable proportion of the design plans and specifications has been prepared by consulting engineers for new developments, and reviewed by County Engineers.

With an ever-increasing demand on the Department of Public Works for utilities for new subdivisions, and projects necessitated by the construction of these developments, the County Commissioners of Baltimore County have seen fit to change the organization of the Department from a "Purpose" type to a "Process" type. It is anticipated that this will afford better coordination and further aid in expediting the processing of contract plans and specifications. The revised organization also provides for additional design personnel.

With the increase in the volume of work produced, the number of personnel within the organization required to complete this work, and the large number of consulting engineers involved in the preparation of contract drawings for developments, the Department realized the need for more detailed standards for design criteria and for standard details. With the approval of the County Commissioners, the firm of Whitman, Requardt and Associates was engaged to provide a sound and workable guide for the standardization of all utility, road and bridge designs prepared for the Department of Public Works.

It is believed that these design standards as prepared by Whitman, Requardt and Associates will serve adequately the requirements of this and other municipalities. In reviewing these design standards, it will be noted that the initiative for the development of contract plans and documents still remains with the design engineer.

The County Design Standards

The Baltimore County Design Standards has been divided into two volumes. These volumes consist of a "Standard Design Manual" and a manual for "Standard Details." By dividing the Design Standards into two parts, personnel such as inspectors and contractors interested only in constructing the utility projects in accordance with the contract plans and specifications, are able to obtain a single volume devoted entirely to standard construction details. Certain tables, such as pipe strength and loading tables, are repeated in both manuals for the convenience of construction personnel.

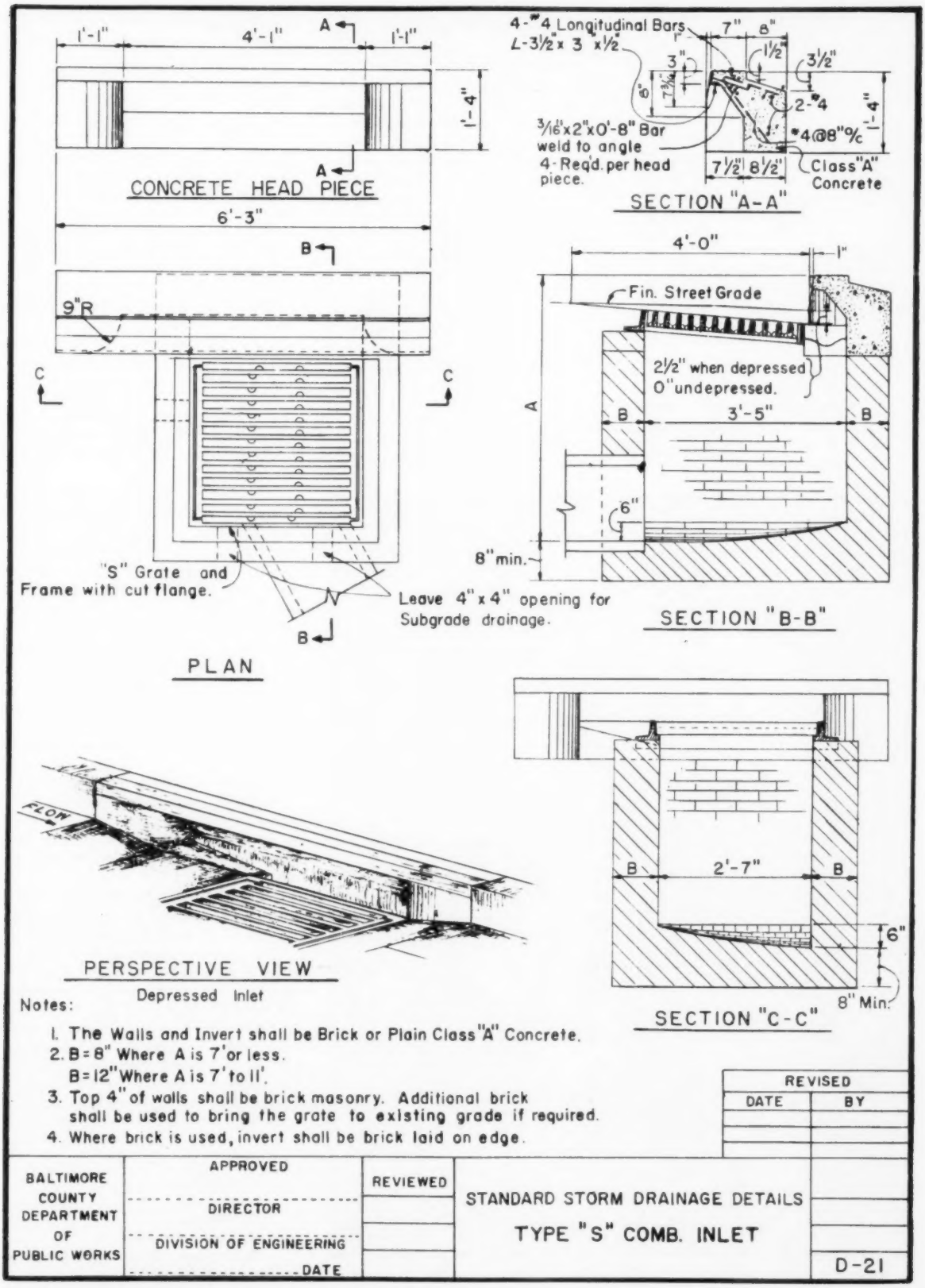
Standard Design Manual—The Standard Design Manual is so arranged that a designer, by following the procedures and design criteria set forth in the manual, can initiate a utility design and carry the project through to contract bidding. For convenience and clarity, the manual has been divided into nine sections:

1. **General**
2. **Sewer**
3. **Water**
4. **Storm Drains**
5. **Sewage Pumping Stations and Force Mains**
6. **Roads and Streets**
7. **Bridges and Culverts**
8. **Land Acquisition**
9. **Contract Specifications**

The "General Section" of the manual outlines what is to be accomplished as part of the specific design project and the manner in which the necessary contract drawings, specifications, design computations and other information pertinent to the project is to be submitted. Information as to size of drawings, standard symbols and general drafting practices are included. The section describes in detail what the designer or consulting engineer is to accomplish in order to fulfill the requirements of the Department of Public Works. As an example, a consulting engineer designing the utilities for a subdivision project will know from the information in the "General Instructions" that he is to complete the following work prior to the acceptance of the project for contract bidding:

1. Prepare preliminary plot plan; 2. prepare tentative plot plan; 3. institute a Public Works Agreement; 4. prepare a Record Plat; 5. prepare Utility Drawings and Documents: a. submit Contract Drawings; b. submit Supplementary Contract Specifications. (Note: The County has a Manual of Standard Contract Specifications); c. submit Design Data and Computations; d. submit Estimates of Quantities.

By following the procedures as outlined, the designer or consulting engineer can complete a design project with a minimum amount of direction from the Department of Public Works, and with a better understanding of what is expected as part of the design.



Notes:

1. The Walls and Invert shall be Brick or Plain Class "A" Concrete.
2. B = 8" Where A is 7' or less.
   B = 12" Where A is 7' to 11'.
3. Top 4" of walls shall be brick masonry. Additional brick shall be used to bring the grate to existing grade if required.
4. Where brick is used, invert shall be brick laid on edge.

REVISED	
DATE	BY

BALTIMORE COUNTY DEPARTMENT OF PUBLIC WORKS	APPROVED DIRECTOR DIVISION OF ENGINEERING DATE	REVIEWED	STANDARD STORM DRAINAGE DETAILS TYPE "S" COMB. INLET	D-21

● **A REPRESENTATIVE SHEET from the Standard Detail Manual. This volume includes details of many utility structures.**

Due to the vast scope of the "Design Standards", space is not available for a discussion of each section. Interesting and unique features such as "Standard Sewage Pumping Station Designs" for various flows and construction conditions, appropriately illustrated, are to be found in these standards.

It is believed that a resumé of the contents of one of the design sections will be indicative of what is included in all the sections. For this general description, the "Storm Drains" section has been chosen.

The "Storm Drains" design section is divided into the following parts:

I. General.
II. Design
III. Contract Drawings and Documents to be Submitted to Bureau of Engineering.
IV. Reference Sources.
V. Design Figures.

I. **General:** Under this item the scope of the section is given.

II. **Design:** A. A discussion is given on the appropriate size at which storm water flow ceases to be transported by closed conduits and open channels are to be used.

B. Closed conduit systems are discussed. The following items are covered in detail: (1) Location of drains; (2) Determination of runoff quantities; a. method to be used; b. runoff coefficients; c. rainfall intensities; d. computations for time of concentration.

(3) Selection of inlets which includes spacing and capacity. (It should be noted at this point that the inlet capacity curves included in this section have been based on the inlet studies of the Johns Hopkins University Storm Water Research Committee which has been sponsored, as a joint effort, by Baltimore County, Baltimore City and the Maryland State Roads Commission.)

(4) Computing pipe sizes.

(5) Materials for pipe.

(6) Appurtenances and Special Construction, which includes how and where manholes, brick curves, etc., are to be used. A description of bends and junction chambers is also given.

(7) Hydraulic gradient determination is described. The head losses due to friction and various structures are noted. Methods for computing these losses are fully described.

(8) Clearances required relative to other utilities.

(9) Structural considerations which include pipe loadings, pipe joints, concrete box structures, etc.

C. Improved open channels are discussed in detail. The location and alinement, quantity of runoff, size and roughness factors are thoroughly reviewed.

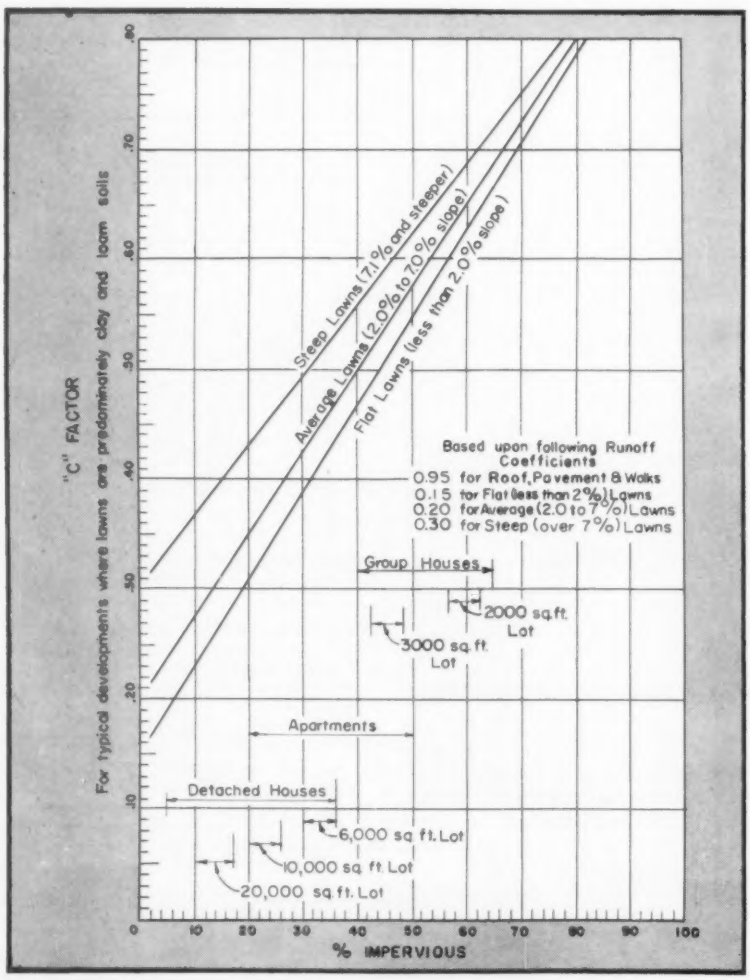
III. **Contract drawings and documents to be submitted to Bureau of Engineering.** A description is given which outlines the detailed information required on the contract drawings and, in general, how it is to be placed on the drawings. A sample of a completed contract drawing is included under this item.

IV. **Reference Sources.**

V. **Design Figures:** Numerous drawings such as curves for runoff factors, pipe loading tables, curves for head losses through structures and other pertinent data required to complete the discussion as shown under Item II, Design. Some examples of these design figures are included as part of this article.

Standard Detail Manual: The Standard Detail Manual includes standard details for utility structures that are common to a standard design and are expected to be found on most utility projects. These details reflect the most efficient structure hydraulically, and the most economical construction methods presently employed in the Baltimore area. As in the Design Manual, details corresponding to the appropriate utility are included as a section of the manual in accordance with the following:

1. General.
2. Sewer.
3. Water.
4. Storm Drains.
5. Sewage Pumping Stations and Force Mains.
6. Roads and Streets.


"C" FACTOR
For typical developments where lawns are predominately clay and loam soils
Steep Lawns (7.1% and steeper)
Average Lawns (2.0% to 7.0% slope)
Flat Lawns (less than 2.0% slope)
Based upon following Runoff Coefficients
0.95 for Roof, Pavement & Walks
0.15 for Flat (less than 2%) Lawns
0.20 for Average (2.0 to 7%) Lawns
0.30 for Steep (over 7%) Lawns
Group Houses
2000 sq.ft. Lot
3000 sq.ft. Lot
Apartments
Detached Houses
6,000 sq.ft. Lot
10,000 sq.ft. Lot
20,000 sq.ft. Lot
% IMPERVIOUS

● **A DESIGN figure appearing in the Storm Drainage section of the Standard Design Manual. This illustrates "C" factors for typical developments and clay soils.**

These details are included as part of approximately 132 drawings which show typical materials and arrangements required by the Department of Public Works. Examples of these details are included as part of this article.

The "Design Standards" are the results of the efforts of many people, both in the firm of Whitman, Requardt and Associates and the County offices. Commendation should be given to the County Commissioners of Baltimore County, Michael J. Birmingham, Augustine J. Muller and Robert B. Hamill, for their ability to recognize the immediate and future engineering problems confronting the County. Special praise is in order for the continuing efforts of John B. Funk, Director of Public Works and his assistants, David H. Fisher and Albert B. Kaltenbach, to obtain a "Design Standard" which would enable the Department of Public Works to discharge its duties in a more efficient manner.

The Department of Public Works Design Manuals are available for use of all design personnel within the County, consulting engineers and construction forces. A charge is made for these Manuals.

Industrial Waste Treatment in Municipal Sewage Plants

In answer to a questionnaire recently sent out by PUBLIC WORKS Magazine, 191 cities reported that industrial wastes were being treated in the municipal sewage treatment plant; 373 cities said industrial wastes were not being treated. This question was one of four asked, the others being; What percent of the total flow is such waste? What kind of waste is it? What basis do you use for charging for these industrial wastes treated? Replies to these questions varied widely and do not yield to ready tabulation.

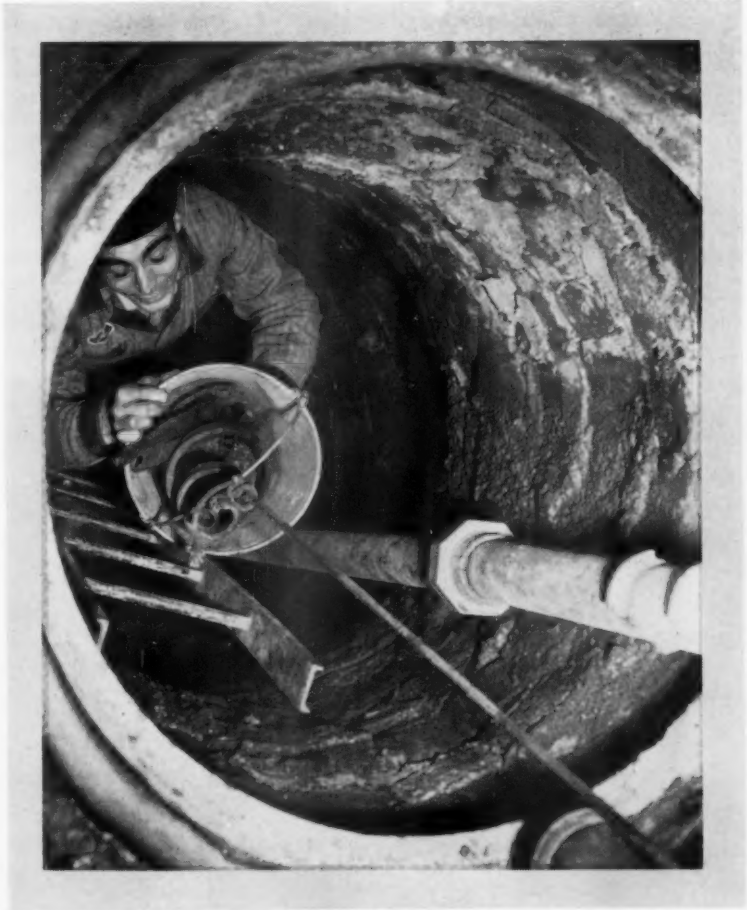
PREVENTIVE MAINTENANCE

Keeps Our Sewers at DESIGN CAPACITY

GEORGE DIAMOND,
Superintending Engineer, Water and Sewer Dept., Cicero, Illinois

PREVENTIVE MAINTENANCE has enabled Cicero, Ill., near Chicago, to improve the performance of its sewer system appreciably. For the past three years, an outside contractor has been removing debris from the town's 115 miles of 12 to 96-in. main and trunk lines before most of it has had a chance to cause serious trouble. Thanks to this periodic cleaning program, there have been far fewer service complaints in the past three years than previously.

Two severe rain storms in 1954 put the plan to its most critical test. The



● **CUTTING TOOL** being lowered into manhole to worker who will attach it to the flexible steel cleaning rod. The rod itself is enclosed in the vertical guide pipe.

first downpour occurred in April; during one weekend, some 3⅞ ins. of rain fell, more than an inch of it within a period of two hours. Service complaints were 40 to 45 percent less than during comparable storms before the preventive maintenance program was launched.

The second storm occurred in October, when 5 ins. of rain fell within a few hours. Basements were flooded throughout Cicero. But the areas that suffered least were those in which sewers had been cleaned before the storm. Storm damage would have been far greater without the preventive maintenance program.

Cicero's original sewer system was laid mainly between 1890 and 1920. Because of infrequent maintenance, most of the lines had lost much of their original capacity. Meanwhile, introduction of air conditioning and automatic washing machines increased sewage flows tremendously. Many new industries were established, and several that were already in business expanded their facilities. A number of Cicero streets have been widened; others, being resurfaced, are receiving additional catchbasins. As a result of these changes, the total storm and sanitary flow has increased considerably.

Cicero is currently in the midst of an extensive sewer survey which, when completed, will provide a blueprint for expanding the system to accommodate this increased load. But it is difficult to determine finally where additional relief sewers will be needed until the existing system is restored to design flow capacity. Our preventive maintenance program, by accomplishing this task on a continuing basis, has been of vital aid in expediting the survey.

Handling Complaints

A key objective of our plan is to pinpoint those locations that are in greatest need of service. Here's how this is done:

Whenever a homeowner calls in to report a surcharge, his name, address, telephone number, and a general description of the trouble are recorded. Then a well equipped three-man crew is sent out to investigate. The crew first makes a visual check of the street main to determine whether flow is above or below normal. If the trouble isn't found in this main, the next step is to rod the line from the rear catch basin out to the junction with the main. Often, this action is enough; but if the blockage is serious, the crew may have to open the line from above. In such case, the amount of rod fed into the line is measured to find out exactly where digging is required.

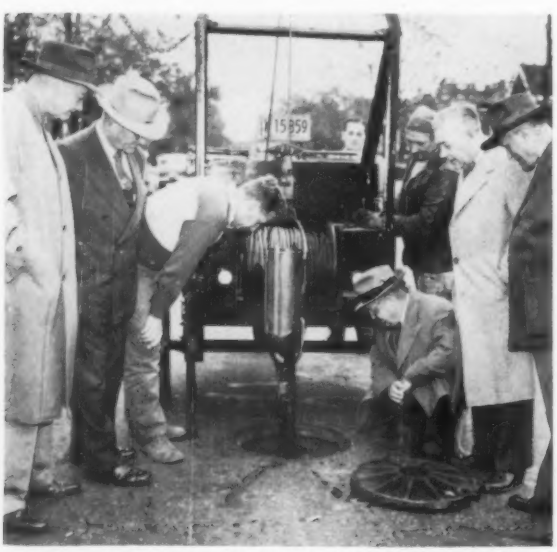
After restoring service, the crew makes a complete report of the work performed for the file. When sewer cleaning operations are being planned (normally the sewer sections to be rehabilitated are selected at intervals of six months to a year), the service reports are analyzed to find the areas where the greatest amount of trouble has cropped up in the past.

This technique gives the general location of each trouble spot. But, before cleaning operations begin, engineers from the water and sewer department, aided by sewer maintenance personnel, go over each area carefully. During and immediately after a rainstorm, four to six crews check manholes on all subtrunks and trunks for excessive or reduced flows. Occasionally, they may inspect street mains as well. The investigation usually enables officials to reduce the area of potential trouble to a few blocks.

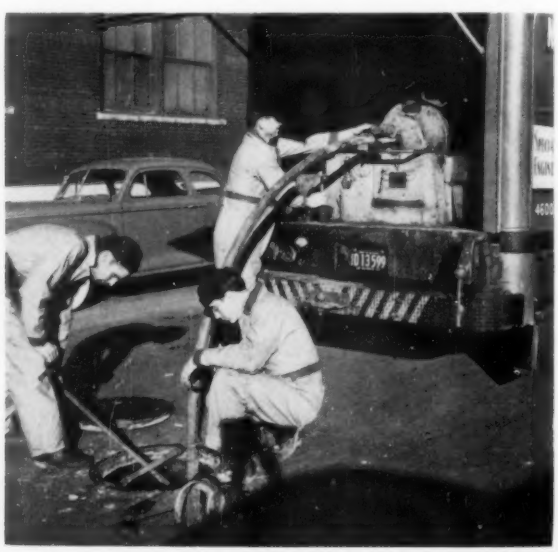
Before the sewers are rodded, all catchbasin openings are cleaned. In this way, the possibility that catchbasin debris will get into a section of line after it has been cleaned is eliminated. This work, done by water and sewer department personnel, is accomplished with the aid of an orange-peel bucket mounted on a dual-wheel dump truck. The bucket fits easily into the opening after the coverplate has been removed.

Next step is to call in the contractor to start the sewer cleaning program with specialized equipment and trained personnel. After all debris has been removed with buckets, wire brushes or scrapers the diameter of the main are attached to the cables and drawn through the section.

As work is completed, the contractor, the National Power Rodding Corp., provides our water and sewer department with a blueprint of each section cleaned. The print gives the date of cleaning, location and size of the main, number of feet and the amount and nature of the material removed. We keep a record of the cleaning operations on a master plan of the Cicero sewer system as a part of our planned program for improvement.



● **LOOSENED** debris is removed from sewer with a bucket. Mr. Diamond, author of this article, observes at far left.



● **NATIONAL** Power Rodding crew shown with truck-mounted power plant. Workman adjusts the footage meter.

CHANGE OF ADDRESS in PEORIA . . .

How to Develop a Uniform House Numbering System

LEONARD H. CARO
Director of Streets and Sewers
Peoria, Illinois

UNLESS someone watches, and plans, and controls, things just happen. Apparently, street numbers just happened in Peoria. There was some system; in fact, there were several systems in use, and the lack of consistent application of any of them produced a confusion in street numbering which existed for years. This was the case when the city council established a uniform grid system of street numbers to end that confusion. In 1955, the City of Peoria completed the first phase of a program putting that new numbering system into effect.

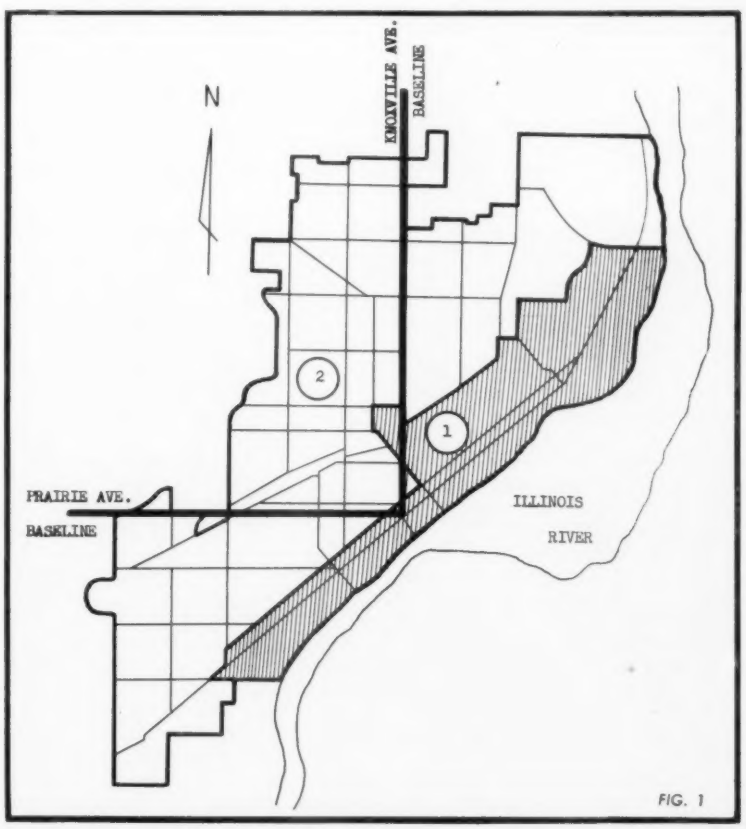
The major aim of the program is the elimination of confusion in the existing street numbers. A second objective is the provision of a system of numbering that is consistent, understandable and flexible enough to meet future expansion and changing conditions without distorting street numbers in use. Finally, it is sought to establish controls, procedures and records by means of which a sound system of street numbers can be instituted and maintained effectively.

Street numbers are a means of identifying a location, a person, or a structure. Anyone who renders service, provides delivery, records location, or just wants to get there, needs a system by means of which he can arrive at a desired location without undue delay. The uniform grid system provides this benefit. Emergency services, such as police, fire, or medical attention, can be rendered without unnecessary loss of time. Delivery of goods to business and residence structures can be improved. Strangers can find their way through the city with a minimum annoyance. Even citizens of Peoria will be able to find their way more easily.

Certain discrepancies in numbering are eliminated by the new numbering system. Parallel streets a block apart will no longer be found with houses differing by several hundred numbers. All parallel streets will be numbered in the same direction from the appropriate baseline street. Streets on corporate boundaries will no longer have address numbers several hundred apart and increasing in opposite direction on opposite sides of the street. Cooperative action with Peoria County solved that. Misnumbers, staggered numbers, half-numbers and lack of numbers can become a problem of the past.

In the variable methods of numbering streets in the past there has been no consistency and no control. Street numbers have been assigned by real estate developers, contractors, home and business owners, and by various other agencies within and without the city government. By ordinance that is changed. The city engineer now makes all street number assignments; and he makes such changes as are necessary to bring about a conformity with the uniform grid system established. No one need wonder whom to ask. Everyone can obtain the proper street number from the office of the city engineer.

In 1955 the City of Peoria completed the first phase of the renumbering program. This involved the interpretation of ordinances establishing the new system; it involved the design of supplementary



● **STREET NUMBERING baselines in Peoria, Illinois. The older part of the city, Section 1, was not renumbered. In Section 2 the coordinate system is being used.**

standards to implement those ordinances; it involved the determination of procedures to do the work and it involved the actual completion of approximately one-third of the re-numbering job.

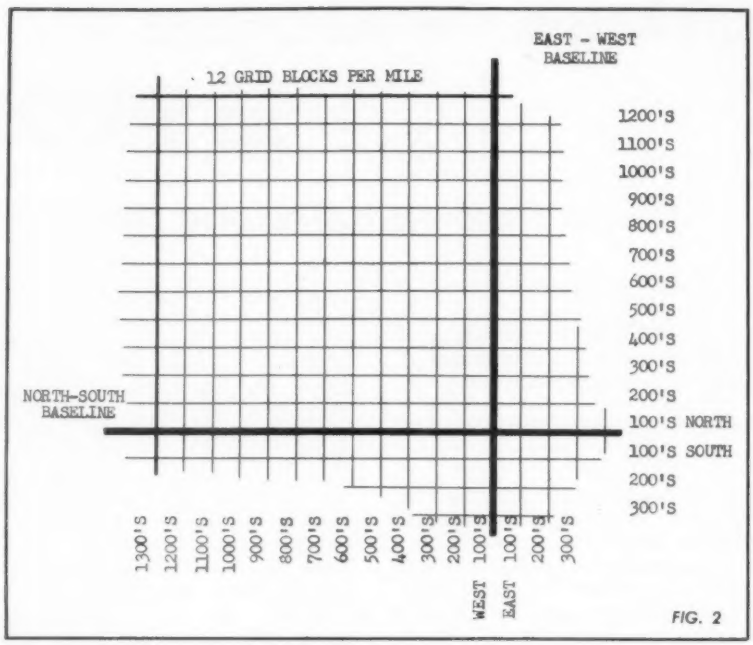
The Ordinances

Following study by several interested groups in the City of Peoria and in Peoria County, the city council passed legislation establishing a uniform grid system of street numbering. The county had acted first, setting up a grid coordinate system and beginning to re-number structures in populated areas. The City of Peoria used the experience of the county to advantage in setting up its own street numbering system. The same general plan was adopted, the same baseline streets were drawn, and the uniform grid system established was designed to coordinate with that of the county. Eventually it is expected that the county will number its entire unincorporated area under the new system. When all incorporated areas of metropolitan Peoria have adopted the uniform grid system, it will mean that the same consistent street numbering is used in all of the neighboring communities.

In establishing the numbering system in Peoria it was recognized that the city is split into two parts by natural terrain features and by the general layout of the city. The older part parallels the Illinois River, running from northeast to southwest. Most of the streets run parallel or perpendicular to the river in the older city which is built upon ground that rises from the river's edge on a gradually increasing slope until reaching the bluffs. From the bluffs, the newer and larger part of the city is spread out over flatter areas, and there streets run predominately north and south or east and west.

Figure 1 shows the older city, Part 1, which is not re-numbered. Streets running parallel to the river from a mid-point baseline street are designated by the prefix "NE" or "SW" to indicate the direction in which street numbers increase. Streets running perpendicular from the river are numbered from a baseline street paralleling and close to the river's edge, and those streets are named with no directional prefix. There is no concern with Part I in the current re-numbering program.

Part 2, shown in Figure 1 as the major area of the city atop the bluffs, comes under the street re-numbering program. It was for this area that the uniform grid system



● NUMBERING grid uses a block length of 440 feet in N-S and E-W directions.

was adopted. This area is laid out in block fashion, with major streets running north and south or east and west on survey lines one-half mile apart. In fringe areas new developments exist with curving streets, dead end streets, courts and circles. Outer boundaries of the major area divide the city from county and from bordering incorporated communities. In this area is the bulk of the new construction, the change and the growth of the city. For this area, then, a new numbering system is established which will better serve the present needs of the city and will accommodate change in the future.

The ordinances establish east-west and north-south baseline streets. Other streets are numbered with reference to those baselines, and each street name is required to bear a prefix "North", "South", "East", or "West" to indicate the direction in which numbers increase. Odd numbers are assigned on north and west sides of streets, even numbers on east and south sides. Numbers increase progressively from one side of the street to the other in the prefix direction away from the baseline street.

The basic re-numbering plan is a coordinate system. Areas to be numbered are blocked out by a uniform grid consisting of twelve blocks per mile in each direction perpendicular and parallel to the baselines. To each grid block a hundred group is assigned, beginning with the 100's at the baselines and increasing in the four principal directions. The basic grid is illustrated in Figure 2.

Not all of the numbers in a hundred group are used in the normal situation. It is required that, wherever practical, a number be assigned to each thirty feet of frontage on a street within each grid block length. In the mathematical grid block, 440 feet, numbers up to 28 on the even side and 29 on the odd side of the street are used, each hundred group beginning with "00" and "01" numbers at the grid block line. In Figure 3 we see the assignment of numbers to the 30-foot interval of frontage.

Since all streets do not run perpendicular or parallel to a baseline, it becomes necessary to provide a prefix designation and street numbering direction for diagonal streets. A diagonal street is numbered and directional prefix determined by predominant line of direction, the entire length of the street considered. The direction of prefix and numbering must be determined arbitrarily in the case of streets which make a forty-five degree angle with the baseline.

The city engineer is responsible for the assignment of legal street numbers to structures. He informs the occupant, agent, or owner of the structure of the number assigned. When a structure has been assigned a number, or the number assignment is changed in accordance

with provisions of the ordinances, that number may not be changed or altered without the consent of the city engineer. Failure to display the number thirty days after proper notice is punishable by fine.

Supplementary Standards

The new system is expected to replace confusion with understandable street numbering. The numbers must mean something to those who use them. The system must be simple. It must be applied consistently.

The street name prefix tells the direction in which the street runs and the direction in which street addresses will increase numerically from a baseline. By providing street numbers for every thirty-foot interval along a street, and by doing so on the grid block basis, the accurate paralleling of street numbers on all streets running in the same direction is maintained. Under such a system, a given numerical address on a street designated "North" by prefix indicates that the structure numbered is a certain distance north of the east-west baseline street. That distance is the same for any other structure on a "North" street with the same numerical address. However, it is necessary to apply that simple system under different conditions which may exist or arise in street layout. The need for consistency, the maintenance of simplicity, and requirements for special conditions call for the design of supplementary standards to implement the ordinances.

Some previous experience in renumbering the city helped in setting standards. Past attempts at doing the job on a patchwork basis provided knowledge of special conditions which might be encountered in the community. The county had already re-numbered large areas. Their experience was helpful and important since coordination with them was required to re-number those streets running on or across the boundary dividing city and county. The gas and light company, the telephone company and the post office offered much information on the use of street addresses for record and distribution purposes. The needs of other governmental agencies, such as the assessors, the election commission, the police and fire departments, and the advice of those agencies, were solicited in determining their requirements in the house numbering system.

With background information available from the sources mentioned and from other interested persons, preliminary standards were drawn for review. Those same persons and agencies reviewed the preliminary standards, individually and in conference. A revision submitted to the city council was approved. The standards provide for the uniform treatment of special conditions in street layout, multiple occupancy units, the use of partial numbers, numbering of corner lots, and the designation of location for numbering purposes.

Street Layout

New land developments with winding streets of changing direction present problems peculiar to each condition. Using the predominant direction of streets and other standards drawn, the newer developments can be numbered under the uniform grid system with satisfactory results. Each special area is considered on its merits. Typical of such street layout is that shown in Figure 4.

Courts, cul-de-sacs and dead end streets are variations of the same street design, *i.e.*, that of only one entrance. Such streets are treated like other streets running in a parallel direction. Street numbers are assigned, odd numbers on one side, even on the other, increasing in a direction away from the appropriate baseline with beginning numbers for the street determined by the distance of the beginning point of the street from the baseline. All streets are numbered as if they ran continuously from the baseline street.

Private drives are not generally considered for street numbering purposes, but there are certain cases in which the private drive might be used to determine location for address.

A private drive might provide the restricted entrance to a multiple dwelling unit, or a business, indus-

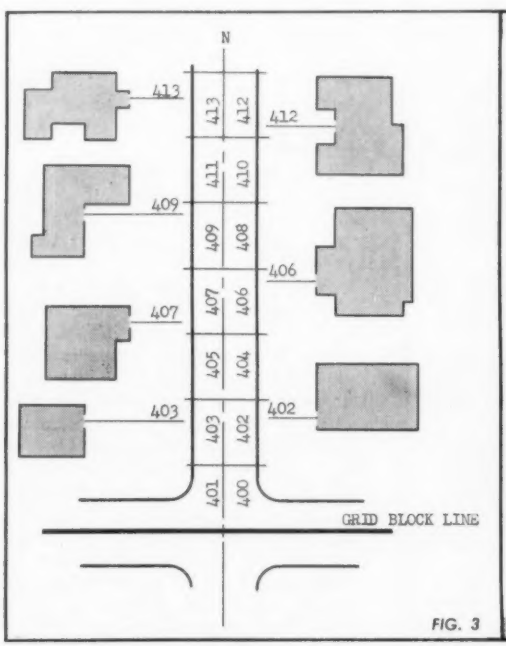


FIG. 3

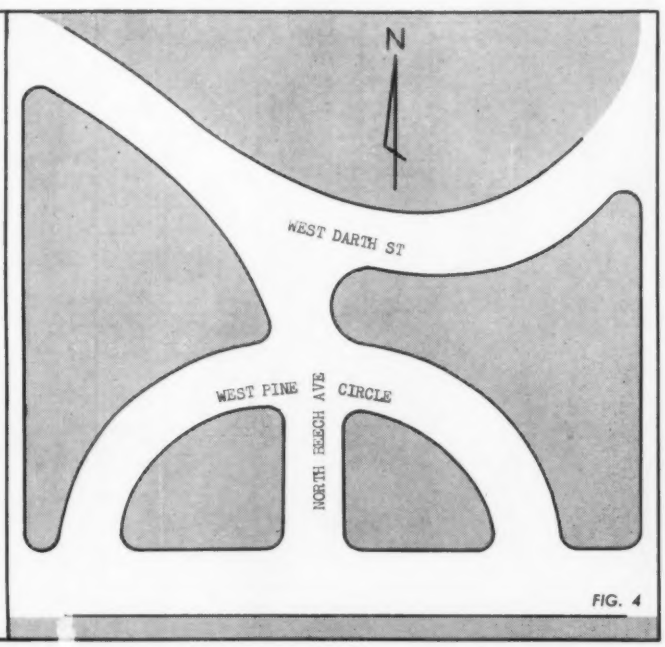


FIG. 4

● **NUMBERS** are assigned at 30-foot intervals. ● **WINDING** streets get directional names to conform with system.

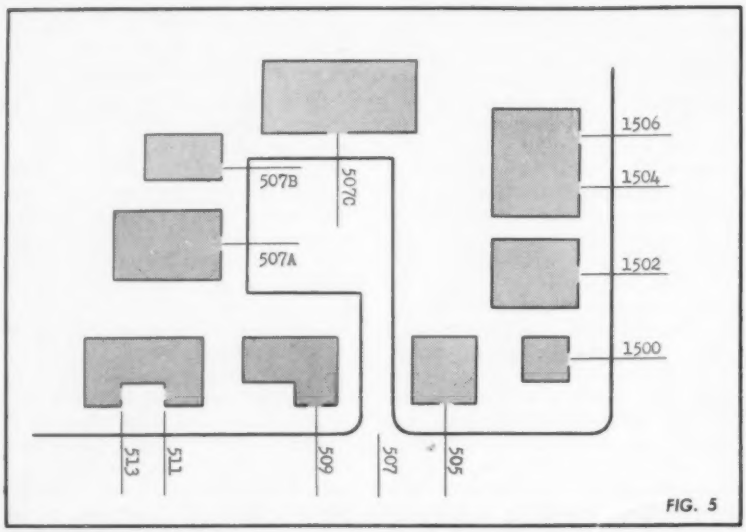


FIG. 5

● **STRUCTURES in block interior receive number assigned to the entrance drive.**

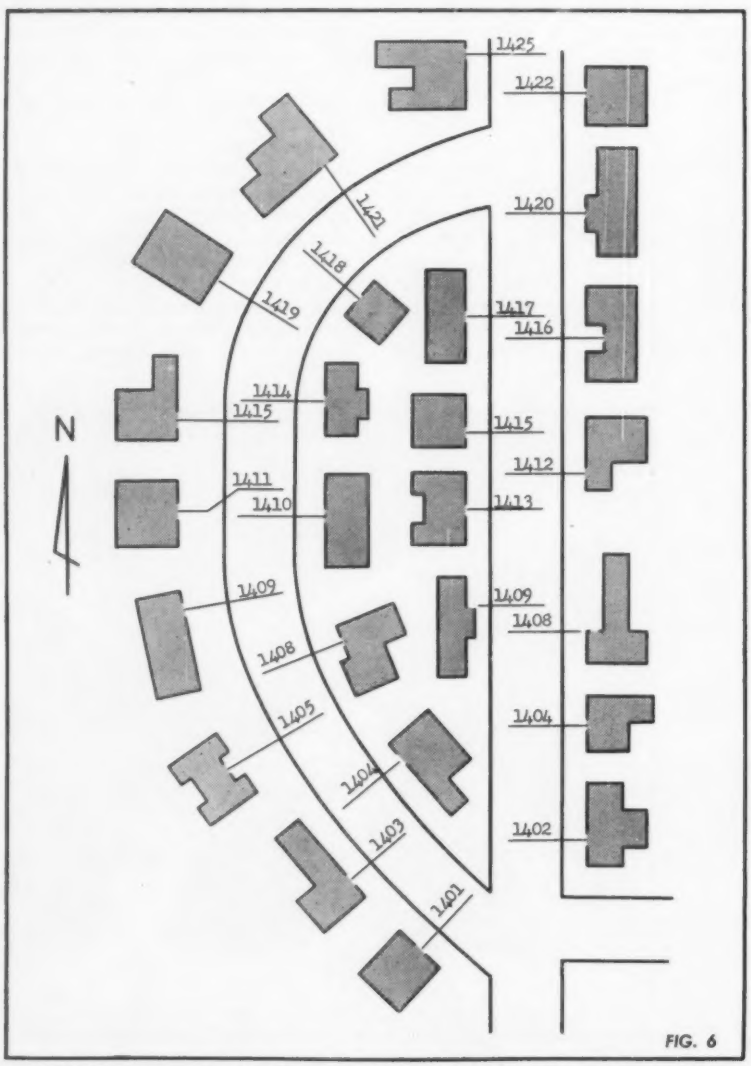


FIG. 6

● **CIRCLES are numbered beginning to end, according to distance from baseline.**

trial or institutional establishment not approached in another manner. If this is the case, the address should be assigned to the private drive at the street, since the street address is used to help locate and approach a structure.

A private drive might provide principal access to the main entrance of a structure so located in the interior of a block that it cannot be considered facing the street except through other structures or possible future structures actually fronting on that street. Then the center line of the private drive, at the street line, should be the location to which the street number is assigned. In such instances, partial numbers can be used for more than one separate occupancy or structure approached by that private drive. Numbers can be used as shown in Figure 5.

A private drive which is of such appearance and access to the public that it serves several structures or units of occupancy as does the court, circle or other public street should bear a name and be numbered as is the public street it resembles.

Circles, streets which depart from and return to the same street, are generally of such a nature that they can be treated as if they ran parallel to that street. Circles should be numbered continuously from beginning to end, the beginning being that point at which the circle departs from the street to which it returns. The beginning is also that point at which the circle enters the street of departure and return at lowest numerical address. Beginning circle street numbers are determined by the distance of the departure from the baseline. See Figure 6 for illustration of this type of circle.

Sometimes a circle departs from a street in the direction of a right angle with that street. When the circle extends in that right angle direction for a distance in excess of the average city block before returning to the street from which it departs, it becomes impractical to number the circle in the manner previously described. The frontage interval cannot be extended or distorted to cover the frontage to be numbered and the designation of street direction prevents the logical use of continuous numbers from beginning to end point of such a circle. Existing circles of this nature should be renamed as two streets and so numbered. Future plats, submitted for approval, and designating such circles, should not be given approval until such circles have been renamed as two streets. This second

method of treating circles is shown in Figure 7.

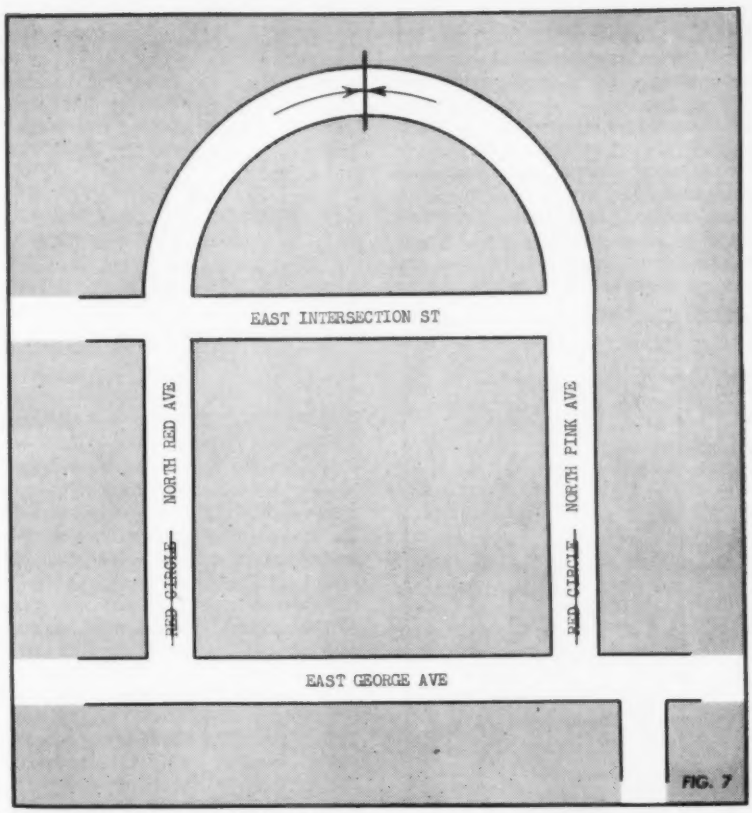
Alley frontage of structures is a special numbering problem. Certain residential, commercial and industrial buildings front upon alleys. Where access to the street paralleling the alley is not obtained, the structure will be assigned a street number on the alley itself; and that alley will be assigned an alley or street name. When normal access to the alley structure is obtained on the parallel street a number will be assigned on the parallel street in a manner described below.

Multiple Occupancy Units—It is desirable to assign a separate street address to a separate occupancy. The two entrances to a duplex house should each be numbered. A business operated from a residence, especially in the case of separate entrance, is entitled to a separate street number. A separate living quarters in a structure built to the side yard or rear yard should receive a separate number. However, when the second entrance to a structure is hidden, when the separate structure is plainly subsidiary or auxiliary in nature, or when there are more than two entrances of separate occupancy to the same structure, then only one street address should be assigned to the multiple occupancy.

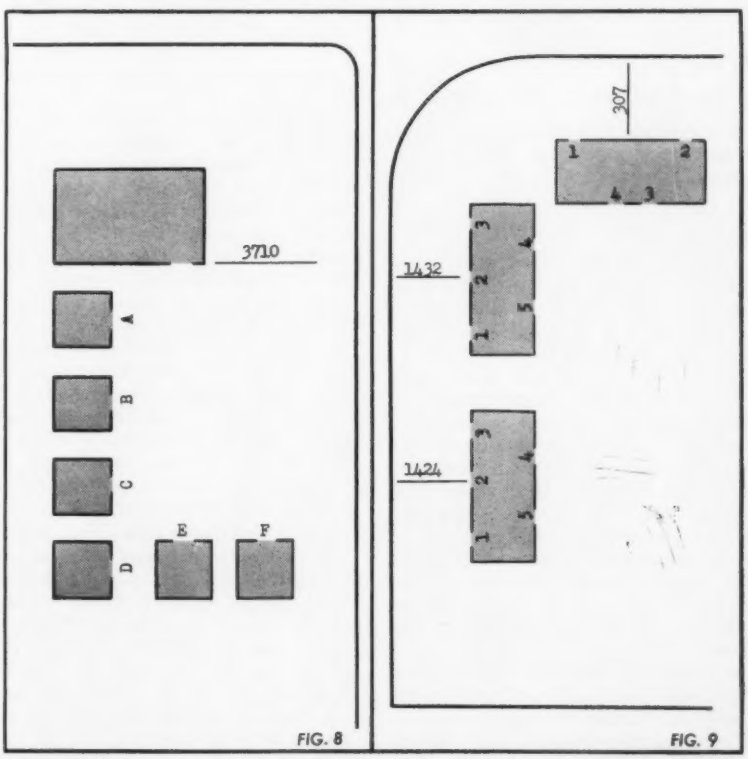
A structure separated into several units of occupancy internally, and having one principal entrance, should be assigned one street address. The separate internal units may be further designated by apartment numbers or letters.

Structures subsidiary to a main structure should not be assigned a street number unless the subsidiary units are themselves units of separate or multiple occupancy to be identified as such. The several units auxiliary to the main building of a motor court, a commercial or industrial plant, or an institution would not be assigned street numbers. The main building to which mail is delivered and through which business is transacted should receive the street number assignment. Figure 8 shows this condition.

The several units of a public housing or garden apartment development often have multiple occupancy units each of which is reached by its own external entrance. Figure 9 demonstrates the manner in which each such unit may be assigned one street number based upon the center of street frontage of the structure, while the separate units of occupancy are given sub-designations by the management of the units.



● **WHERE a circle extends in this manner, it must be re-named as two streets.**



● **A MOTOR court or similar multiple occupancy unit is assigned a single street number as shown on left. Apartments, shown at right, are treated in same manner.**

A structural unit, not part of a group of similar units, and divided into several sub-units of separate occupancy reached by separate entrances fronting on the street should be assigned street numbers for each unit as shown in Figure 10. It may be necessary in such cases to change the numbering in the localized situation by assigning more than one number in each thirty feet. When several such units are adjacent on the same street it is advisable to use a smaller interval for number assignment.

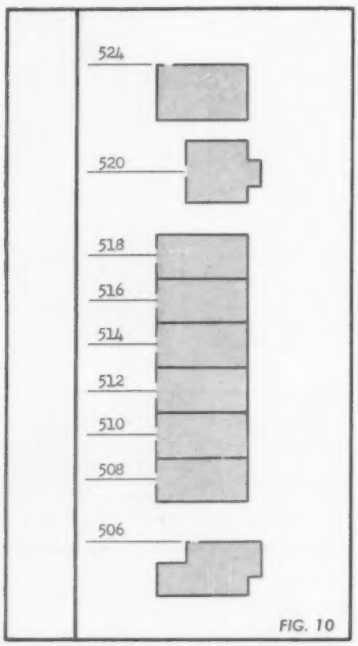


FIG. 10

● **LOCALIZED conditions involving street entrances at close intervals may require departures from the standards.**

Duplex housing, built or converted for such use, and having a separate entrance for each occupant, is assigned a street number for each entrance provided that entrance is not hidden. When one of the entrances is hidden from view to a person on the street, then the same number assigned to the front entrance applies to the rear. However, the rear entrance is assigned the suffix letter "R" in use of the address as indicated in Figure 11.

A separate structure hidden behind another which fronts on the street is assigned the same address number as that displayed on the front structure. Such a hidden structure can be given the suffix letter "X" with the street number to point out the fact that it is hidden behind the structure bearing that street number. This use is shown in Figure 11.

Partial Numbers—It is undesirable to assign partial numbers to separate occupancies where those occupancies are reached by separate external entrances. In the past partial numbers have been used in two forms: the half number and the alphabetical suffix.

The thirty-foot interval of frontage is sufficient in most cases to provide more than enough numbers for occupancies on street frontage. Where an occasional localized condition requires more than one number in thirty feet the numbering is sufficiently flexible to permit the use of separate street numbers by borrowing the number from the next interval without greatly distorting the numbering sequence.

In a closely built business locality, it may be necessary to change the interval for numbering assignment. By maintaining a grid block at the mathematical length of 440 feet, or close to that figure, only fifteen numbers out of fifty on each side of the street for the hundred group are used. There is nothing to prevent the application of a fifteen foot interval to a block where the condition warrants that application. Use of the fifteen foot interval provides twice as many numbers and need affect no other than the block in which it was found necessary. The grid is not affected, since the hundred group still occupies the same length along the street.

On the other hand, there may be cases where only a localized section of the block is closely built up. In this case the fifteen-foot interval provides sufficient numbers for that localized condition; but for the rest of the block well-spaced structures would then be numbered so far apart numerically as to cause confusion. If borrowing numbers for the closely built area, as previously suggested, is not practical, then partial numbers might be the only logical answer. Half numbers are difficult to read and present a problem where business systems do not contain the half number for machine billing purposes. Therefore, the alphabetical number, such as 103A, 103B, 103C, is recommended where absolutely required.

Numbering Corner Lots—The corner lot structure is assigned a street number determined by the facing of the principal entrance. If the principal entrance is so located that it could be considered fronting on either street, then the choice of frontage for street numbering assignment is determined by one of two governing factors: (1) direction of frontage of the lot upon which the structure is built, and (2) ease of identification of the number from the street.

Location for Numbering—A street number is assigned to every thirty-foot interval of frontage along each street. The structure falling within that interval takes that street number. Long structures might cover three or more intervals, and other structures may not fall each within an interval. To select a consistent and logical point to measure, and to secure a uniform increase in numerical address on every street, the front entrance is chosen as the determining location for street number assignment. A perpendicular line from the center line of the front entrance falls in the thirty-foot interval from which the street number is assigned.

Procedures

Procedures adopted for the work involved in changing numbers were based upon the record system available, the limited personnel to be used and the needs of various organizations for the notice of numbers change. These procedures have undergone test and refinement in the actual numbering of part of the city. They will be used to re-number the remaining areas to come under the uniform grid system of street numbers.

Field Measurements — Using a measuring wheel, and recording data in an engineer's field notebook, all streets are measured along center lines. Location measurements of all principal entrances to structures are taken according to frontage on a street. Special conditions which affect the assignment of street numbers are noted and recorded. Existing street numbers for each structure are recorded with the entrance location measurement.

This work has usually been done more effectively by two men, one measuring, the other recording data. On occasion, both jobs have been accomplished by one man.

Field measurement proceeds in quarter section (one-half mile square) area units, beginning at the northern end of the city and moving from one quarter section to the adjacent one from east to west, covering a strip across the city one-half mile wide. When measurements have been completed in one strip of quarter sections the next southerly strip is worked.

Plotting Field Measurements Data—A print of each quarter section under consideration is laid out in uniform grid blocks superimposed on the print in red pencil lines, six hundred groups in the half mile distance, north-south and east-west.

The location of each principal entrance measured in the field is plotted to scale along the various streets of the quarter section print, each entrance indicated by a red pencil line drawn perpendicular to the center line of the street upon which the entrance fronts. The existing street number of each entrance measured is written in blue pencil above the entrance location line on the quarter section blueline print.

Existing street numbers, not showing on structures and not obtained in the field measurements work, are determined from the records of the engineering department, assessor's office, gas and light company, the telephone book, the city directory, and other sources. In some instances field checking is required to obtain those numbers.

The requirement that a plot plan be shown before a building permit is issued makes it possible for new structures to be plotted on the quarter section prints. The building permit is issued under a street number

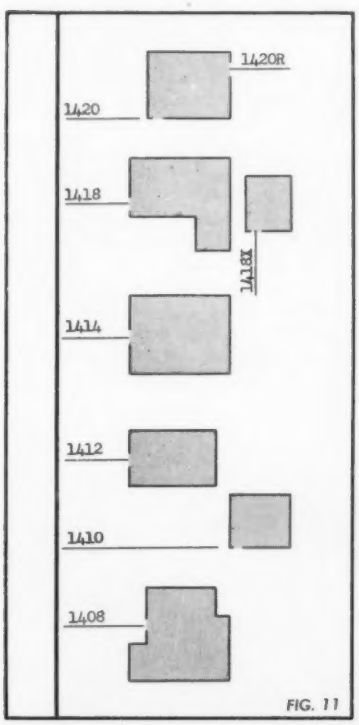


FIG. 11

● **SPECIAL designations used for rear entrances and for hidden structures.**

assignment made by the engineering department. When that street number assignment is requested, the entrance location and owner's name is obtained from the building department. The structure's entrance is then plotted to scale on the print with number assignment and owner noted.

Listing Occupants — Lists of occupant and/or owner for each entrance measured in the field are compiled in tabular form under the column headings "Name", "Old Address" and "New Address", the same to be used later in making change of address sheets. Explanatory text above the column headings notes the name of the street for which addresses are listed, the beginning and end point of addresses listed from one intersecting street to another, and the effective date of change. The new street number assignment can be added to the list later. Name and old address are listed at this time.

Because most separate occupancies have gas or electricity, the records of the gas and light company are used to obtain the names of current occupants at each address. The list sheets are grouped by streets within the boundaries of a quarter section as printed from the record tracings of the engineering department.

Preliminary Assignment

New number assignments are provided for each structure or entrance of separate occupancy, using the standards established by ordinances and the supplementary standards needed to implement those ordinances.

The new street number assignments are determined by the location of the front entrance in one of the thirty-foot intervals, the interval indicating the number to be assigned. That number assignment for each principal entrance is written on the quarter section print in red pencil below the entrance location line previously described. When completed, the quarter section print shows all existing entrances to be numbered, each located to scale on the street which that entrance fronts. The entrance is indicated by the entrance location line with existing street number above the line in blue and the new number assignment below the line in red.

New numbers having been assigned, those numbers can be written on the tabular lists of occupancy in the proper place to show new address assignment. The lists of occupancy are then the bases for the change sheets to be used for notification of street address change to residents and interested agencies.

Publicity — Adequate publicity begins with city council approval of standards and procedures for conducting the re-numbering program. News articles, radio and television media are then used to the maximum extent to explain the program to the public. What is to be done, why it is done, how, when and where it will proceed are explained. Letters are sent to all occupants in the area to be re-numbered, explaining the program and the sequence of events which follow in street re-numbering. Much of the program's success depends upon the effectiveness of publicity, both before and during the making of street number changes.

Preparation of Change Sheets —Change of address sheets are made up directly from the lists of occupancy and in the same tabular form. Each sheet lists the occupant, old address, new street address, and a street name change if any is made. Each sheet shows number changes on one street, or from one street to another street, limited by the number of listings which can be made on the page. Intersecting streets between the beginning and end points of the addresses listed are written in proper sequence.

All change sheets required to assign numbers in a particular quarter section are made up at the same time and grouped for further action on that area basis. Change sheets are used for several purposes:

a. Mailing to individual addressees to assign street numbers.

b. Mailing in booklet form to interested agencies to effect a change of record of official numbers.

c. Use in checking compliance with street number assignments.

d. Check-off use by personnel enforcing street number assignments.

e. Use as an official record of street number changes made.

Mailing Change Sheets — Change of address sheets are mailed to individuals to notify them of their new street number assignment. The sheets are sent as thirty-day notices of the effective date of change, permitting ample time for the purchase and placing of numbers on structures in accordance with specifications for the use of street numbers. The same change sheets are bound in booklets and sent to interested agencies for change of record.

Field Check — A field check must be made to determine compliance with street renumbering. At the time this field check is made, shortly before the effective date of change, warning letters are delivered where the new numbers are not displayed. The letters inform the occupant that his failure to display the new street number denies him and his neighbors the advantages of a consistent numbering in keeping with the uniform grid system effected in other parts of the city. The citizen is further informed that the number change has been made with the post

office, police and fire departments, the city directory, utility companies, and other private and public agencies using his address. The legal penalty for non-compliance is cited, and the individual is urged to display his new number by the effective date of change.

A second check must follow immediately after the effective date of change to determine non-compliance. An accurate check-off on the change sheets produces a reliable record of those addresses which have not been changed. That record is turned over to the enforcement agency.

Enforcement — The enforcement phase should be handled by the police department. With a reliable record at hand in the form of the 'check-off change sheets, policemen should personally visit those who have not made the number change, giving them five days in which to display the new street number. A second visit by a uniformed police officer is made to check compliance with this order. If the new number is not up, a citation should be issued against the owner or occupant and a new order to change the number should be issued.

Permanent Record — When renumbering of an area is completed, a permanent record of street number assignments should be made. This record is kept in the form of quarter section tracings securely bound and protected in a book binder. Changes made in street numbers can be made to the record tracings on a current basis. Only one simple record need be kept. Copies of this record can be reproduced for any agency by printing the record tracing.

Continuous Operation — Continuous operation of the assignment of street numbers under the uniform grid system is achieved through current posting of information in the permanent record. Additions can be made without affecting any other existing records.

To assure provision of required information for current posting, some kind of control is required. The control is the rule that no permit for erection, alteration for number of occupants, or the razing or moving of a structure shall be issued until the engineering department has issued the new number or been informed to remove the old number. This is achieved through cooperation of the building department. When a permit is written by the buildng department the names of owners, locations of entrances, and other pertinent information are given to the engineering department in exchange for the street number assignment to be used by all parties concerned.

Results in 1955

Approximately one-fourth of the numbers to be changed in approximately one-third of the city area affected, have been made. Several hundred number changes have been made for or with Peoria County and the bordering Village of Peoria Heights on the basis of inter-governmental cooperation at boundary areas.

It will take some time for everyone to adjust to the new numbering system. The post office bears a large part of the burden in switching over, but business, schools, and other agencies and institutions in Peoria must be given credit for a large measure of cooperation and effort expended to make the program a success. Citizen cooperation should be mentioned. In a rather difficult overall project for the average citizen to understand, once an initial storm of controversy subsided, active participation on the part of those persons affected was indicated by a compliance of over 92 percent in the display of new street numbers before any enforcement procedures were instituted.

With the initial phase completed in 1955, the remainder of the city renumbering is expected to be completed in 1956.

A Privately Financed Toll Highway

The Maine Turnpike holds the distinction of being the pioneer privately financed toll highway; it now has 106 miles of modern expressway beginning at Kittery, the gateway to Maine, and ending at the State Capitol in Augusta. Its design and construction provides the last word in safe and comfortable motor vehicle travel. Its opposing lanes of travel are separated by a center strip 26 feet in width. It has 10-ft wide safety shoulders on both sides for its entire length and with gradual curves and easy grades, it permits a uniform rate of speed from beginning to end. There are fourteen interchanges conveniently located along the main line plus an interchange where the Falmouth Spur connects with route U. S. 1 north of Portland.

To finance the 106 miles of the main line of the Turnpike plus the 4 miles of the Falmouth Spur $75 million was required. The expected traffic for 1956 is 5,162,000 vehicles. The estimated revenue from tolls and concession is $4,815,000.

The Maine Turnpike Authority operating the Maine Turnpike is an agency of the State and is a non-profit organization. The law provides that when all bonds and interest have been paid, the Turnpike becomes the property of the State of Maine and the Authority shall be dissolved. When the Turnpike is turned over to the State, it will be run by the Highway Commission.

● **A VIEW of the 106-mile long Maine Turnpike, which extends from the State's southern border to its Capitol at Augusta. Here it sweeps west around Gray Village.**

A WATER PLANT

Can have the Operating Efficiency

of MODERN

INDUSTRY

LEE RIBET

City Manager of Valdese

W. K. DICKSON

Consulting Engineer, Charlotte, N. C.

A NEW 2 mgd water filtration plant was dedicated on July 20, 1955, by Valdese, N. C. This new plant has modern architectural treatment and pneumatic and other controls for efficient operation.

Valdese built a filtration plant in 1935 and later expanded it to its present capacity of 1 mgd. However, all of its textile mills are heavy users of water; in fact, three of the fourteen mills use one-half of the capacity of the original plant. With its new $500,000 plant, Valdese can more than meet the demands by filtering water for sixteen hours each day. On weekends, when the textile mills are closed, Valdese operates the original plant to meet the domestic requirements of its 4,000 residents.

Designed by W. K. Dickson and Company, Inc., and constructed by Boyd & Goforth, Inc., of Charlotte, N.C., the new plant can be easily expanded to 6 mgd capacity when new industry moves in and requires more water. If even more water is needed, there is still no problem because the present plant site will accommodate a 12-mgd filtration plant. Also, since water supply for Valdese is unlimited, additional plants can be built as needed.

Raw water is pumped from Lake Rhodhiss which is fed by the Catawba River. Two Fairbanks-Morse vertical turbine pumps, driven by 100-hp GE motors, deliver water to the plant, each at the rate of 1400 gpm. The filter plant is 500 horizontal and 160 vertical feet from the pump house and connected to it by a 16-inch main. S. Morgan Smith check valves are used in this main to provide easy opening and closing without surges.

The raw water pumps are protected by a manually cleaned bar screen in the pump house. The pump house will accommodate additional pumps to deliver 6 mgd.

Raw water flow rate is measured in the manhole nearest the plant by a Venturi tube and a Brown (Minneapolis - Honeywell) electric meter

● **ALL PLANT DATA are available on recorders located in the operator's center of activity, the laboratory on the second floor. Buttons give remote control of pumps.**

body. The differential pressure across the tube is applied to the meter body to position a characterized float. Then, through a three-wire, inductance bridge circuit, a recorder pen follows the float position so that a Brown evenly graduated flow receiver records, indicates and totalizes the raw water flow rate. This instrument is conveniently mounted on the main instrument panel in the second-floor laboratory.

In the main ahead of the chemical feeders, a Beckman flow type pH cell measures the pH of the raw water. This pH is indicated by a Beckman amplifier and indicator mounted near the chemical feeders. It is also recorded and indicated by an "ElectroniK" potentiometer mounted on the laboratory instrument panel. Thus the operator cannot only watch the raw water pH when he adjusts the chemical feeders, but he has the same data before him at his centrally located laboratory.

Alum and soda ash are fed by Omega dry feeders into the raw water main ahead of the mixing basin to insure better mixing than can be obtained by feeding the chemicals directly

into the mixing basin. Equipped with a Walker Process flash mixer, the basin has a retention time of two minutes. Chemicals are received by truck and moved to the second floor storage and feeder room by a hydraulic elevator.

From the mixer, the water flows to a flocculation chamber with a retention time of 30 minutes. This chamber has Walker Process horizontal paddles with a Reeves variable speed drive manually set by the operator. He can vary the peripheral speed of the paddles from 0.5 to 1.5 fps. The water flows from the mixer into conventional rectangular settling basins with a retention time of four hours, and over a weir to two 18 by 20-ft. rapid sand filters which filter at the rate of two gallons per square foot per minute.

Pneumatic Filter Controls

The two filters have Wheeler false bottoms and use gravel and Anthrafilt media. Each is equipped with four Palmer sweeps for surface washing and agitation during backwashing. The operators control these filters from two "Filtermatic" consoles which provide pneumatic positioning of all valves.

Four rubber-lined R & S butterfly valves and two double-seated plug valves control the flow rates through each filter. All valves are positioned by Honeywell Series 800 diaphragm motor operators and are designed to shut tight whenever the air pressure is less than 3 psi.

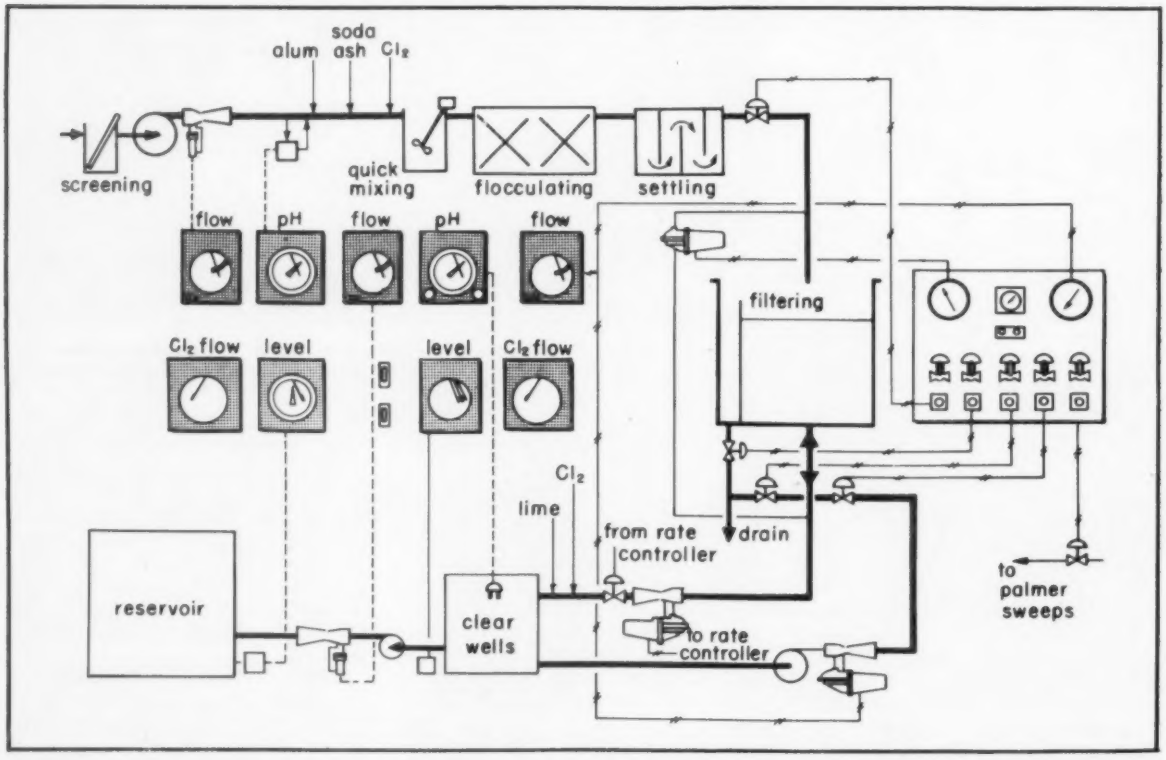
The Filtermatic consoles for both filters are identical. Each is equipped with a loss of head indicator, a finished effluent indicator, with associated rate setting controls, a wash water rate indicator, start and stop buttons for the wash water pump, five valve position indicators and five air pressure regulators for positioning the valves.

All of the valves operate on 3 to 15 psi air signals and are fully open at 15 psi and closed at 3 psi. The 10-inch heavy duty effluent valves are automatically positioned by "Tel-O-Set" controllers to maintain the filtering rates set by the operator. All of the other valves are manually positioned by the operator through adjustments of the console-mounted pressure regulators.

For backwashing, butterfly valves control wash water flow rate and the waste water flow to the drain. The plug valves control the flow of water to the Palmer sweeps and the initial flow of filtered water to waste. Except during backwashing, the operator simply sets the filter rate controllers for the desired filtering rates and then can leave the operating floor to attend other duties. The filtering rates are automatically controlled and continue as long as the clear wells and the town reservoir are not full. During backwashing, the operator does not have to move from in front of the console for the filter being backwashed.

Filter effluents and wash water flow rates are measured by Venturi tubes and Differential Converter transmitters. A Differential Converter unit balances a 3-15 psi air signal against the head differential across the Venturi created by the flow through it. The resulting air signal is, therefore, proportional to the flow rate and is transmitted to the indicating and recording instruments.

In the case of the wash water flow rate, the signal is transmitted simultaneously to a dial indicator on each console and to a circular chart recorder mounted on the laboratory wall panelboard. The flow signals from the filter effluent measuring systems are transmitted to a console-mounted rate indicator and a Tel-O-Set controller. The controller compares the actual filtering rate with the desired rate and pneumatically adjusts the filter effluent valve to filter the desired rate. Manual switches and a pressure regulator on the flow rate indicator permit the operator to change the set rate of filtering or to bypass the controller and position the filter effluent valve directly from the console.



● **INSTRUMENTATION at the Valdese, N. C. filtration plant showing location of primary metering elements and controls.**

Finished water flows to two clear wells each of which provides storage capacity for 210,000 gallons. Two Fairbanks-Morse vertical turbines pump the water to the one million gallon reservoir located in Valdese, 3½ miles from the plant. One pump has a capacity of 2100 gpm and the other 1100 gpm. Both pumps are driven by GE motors with ratings of 200 hp and 100 hp respectively. The plant power supply is delivered at 550 volts to a GE Cabinetrol switch board.

Central Instrument Panelboard

From the central instrument panelboard in the second floor laboratory, the operator can start and stop both raw and finished water pumps. He can also read flow rates and total flows of raw, finished and wash water. In addition, he has continuous data on the pH of the raw and the finished water, chlorine flow rates, and the levels in the clear wells and the town reservoir.

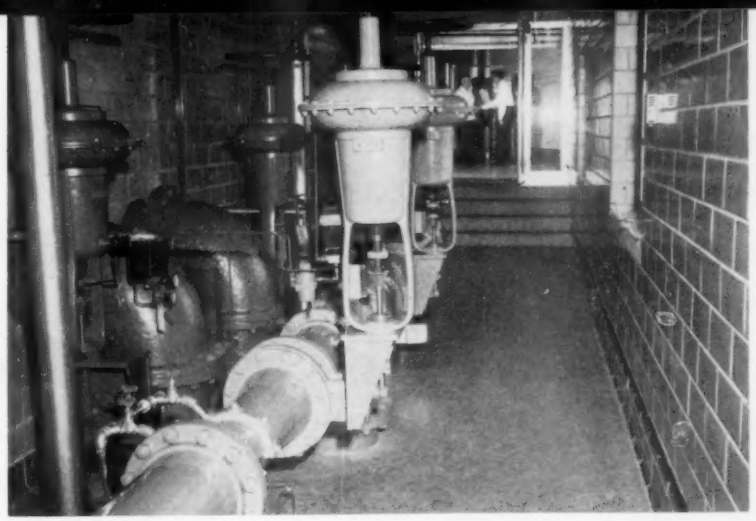
The entire Filtermatic control system, designed by the Minneapolis-Honeywell Regulator Co., is provided with alarm contact switches and automatic controls so that safe operation is assured at all times. If the reservoir level or a clear well level reaches 15 feet, the pen on the corresponding level recorder on the panelboard actuates a switch which in turn shuts down the pumps and sounds an alarm.

The ElectroniK pH recorder for the finished water is equipped with a pneumatic control unit which automatically adjusts the rate of lime feed to maintain the desired pH.

Within the modern, angular exterior of the new water treatment plant, all interior walls are glazed tile with plenty of glass to accentuate a bright, clean look. All the floors are terrazzo except those in the pump room, chemical storage room and observation deck, which are of quarry tile. The second floor and the roof are constructed of prestressed, precast six by twelve-inch concrete slabs, each lightened by two 4-inch diameter cylindrical cells. With the entire plant designed for low cost maintenance and efficient operation, only one operator is required during each of the two eight-hour shifts, and a part-time supervisor has time for other municipal duties.

Clean and Attractive

Since visitors are always welcome, the plant is designed to stay clean with very little effort and to appeal to the visitors as well as to be functional. The pump room is to the left of the main lobby, and glass doors across the lobby from the main entrance lead to the pipe gallery. Both rooms can be viewed from the lobby, and with their color-coded piping and valves, are attractive to the lay as well as professional visitor.



● **PIPE GALLERY, just off the entrance lobby, has color-coded diaphragm valves. Its bright, spotless appearance is in keeping with the rest of the plant interior.**

● **RAPID SAND filters and operating consoles are adjacent to the plant laboratory. Pneumatic controls are provided for operation of filter flow control valves.**

Wide stairs lead from the lobby to the filter operating floor and to an observation deck above the pump room. From the observation deck, the visitor has a panoramic view of Lake Rhodhiss and the Blue Ridge mountains. From the second floor he can look through the pump floor into a sight well to note the clarity of the water. A modern mosaic design at the bottom of the well helps to prove the clarity. Alongside the well is the wash water flow measuring system consisting of a Venturi tube and a Differential Converter transmitter.

All persons involved in the initial planning of the new filter plant were determined that the pipe gallery would always be at its "Sunday" best with a minimum of maintenance. It was designed so that the piping and valves can be inspected without getting wet feet or descending to a dark, damp dungeon. With windows along one wall, and glass doors at both ends, the light, bright pipe gallery at Valdese is also dry as a result of the use of pneumatic controls and rubber-lined butterfly valves which do not leak.

As constructed, the new Valdese water filtration plant employs the basic treatment methods that have been proved in other plants throughout the world, but it uses modern techniques designed to increase efficiency, reduce maintenance and lower operating costs. For the present, the townspeople, the town's industrialists, the consulting engineers, the contractors and the operators have water treatment facilities that meet their needs. When additional facilities are needed, the present plant and its file of instrument records will aid in again building better treatment facilities than were available heretofore.

ENGINEERING Solves the Refuse PROBLEM

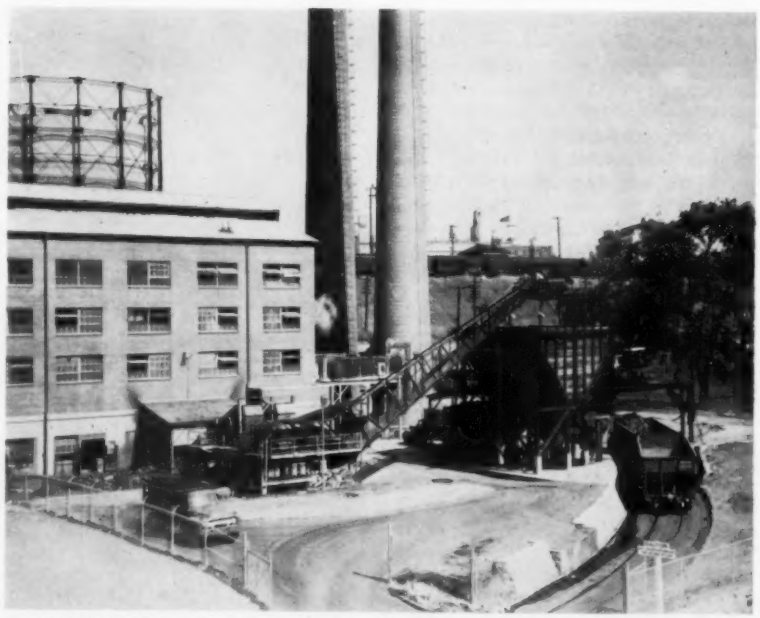
GUY BROWNING ARTHUR

THE BENEFITS derived by a community from engineering projects may be measured in various ways. They may be immediate and obvious, or they may appear slowly, as from long-range foundational undertakings. When a city is made one of the cleanest in the country, and at low cost, the benefits are immediate, but also long range, and show up on every street. Taxpayers have a yardstick by which they can measure the efficiency of operations.

Atlanta has stood at the top in general cleanliness and in clean-up drives for years. In the succession of annexations of fringe areas the factor that has done most to appease objectors was the prospect of sanitation services equal to those in the city. To have the full range of the schedule of garbage and household trash collection, street cleaning, sewer flushing, disposal of heavier refuse, and inspection of environmental conditions, was more potent than any other expected gain.

In its public relations the Sanitary Engineering Department, administered by S. W. Graydon, Chief Engineer, has always had the Chamber of Commerce, the Junior Chamber, or Women's organizations to spearhead the drives of various kinds to clean up the city, letting the glory fall where it may. Behind the front the Department thrives and progresses with efficiency.

It operates at a lower cost to the taxpayer than similar departments in cities over 200,000 population. The sanitation fee is $14 to all within the city, for the full schedule of services. In many other areas, it is twice as much for garbage collection, including household trash, alone.



● **ALL RESIDUE at the discharge end of the plant passes through rotary screens. Ash drops into trucks; cans are crushed and conveyed to hopper for loading in cars.**

Collection costs the city $1,600,000. If the refuse were disposed of in some usual way the tax might be very high. In Atlanta it is burned in a modern incinerator, cans and scrap metal are sold, and enough steam is sold to the Georgia Power Company to heat all of downtown Atlanta. The incinerator operates at a profit which pulls the over-all operating cost of the department down to a low figure.

The incinerator contributes to the welfare of the community in other ways. If each office building and department store had its own heating plant their overhead would be much higher; rents would be higher; stacks would pour out smoke and dirt to clog the atmosphere and change the appearance of the community for miles around. Keeping store fronts clean would cost more; streets would not be as safe; housekeeping would be more burdensome; street cleaning would cost more.

As it is, because of the incinerator, there is no smoke, smog or smell. The absence of the smoke nuisance is not appreciated by Atlantans because they have never had it; they

never think of it. Many another big city would marvel at the clear atmosphere, and the freedom from smudge over everything.

Collection System

Unlike most sanitary departments, this one wants all the garbage and trash it can get, and invites commercial houses to bring in everything combustible. Except for large limbs, Christmas trees and similar material, which is hauled to land fills, it is all grist for the mill. It makes steam, and steam brings in money. In 1954 about 171,160 tons of garbage were hauled, and 167,279 tons were burned.

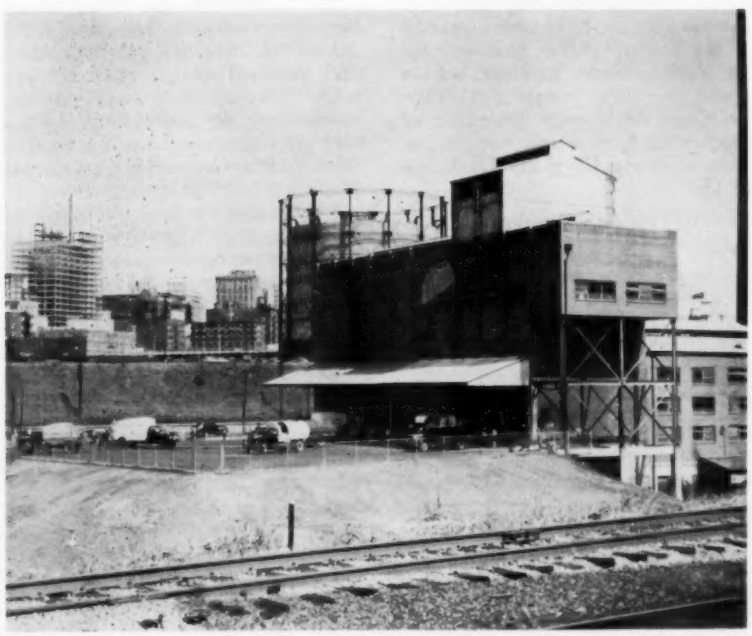
The collection system is similar to that in many other cities. There are 160 packer-type trucks of several kinds on 124 collection routes, making two trips each week in the city and one trip each week in outside areas. Atlanta covers 137 square miles, and has 2800 miles of streets. What is called the sanitary area covers 200 square miles.

There is one collection each night for commercials, with two crews. One crew works from 9 at night to 5 in the morning; the other one starts at 11 o'clock and carries through to 7 o'clock.

Some cities are very strict about separating garbage from household trash. In some the collectors will not pick up mixed refuse. In the same way, many places insist on having the cans placed on the curb. In Atlanta no separation is required, or desired. Collectors go in 100 feet from the curb to pick up cans. Commercial establishments, however, because of more difficult access, must place their refuse at the curb.

Heavier materials, or unusual accumulations, as from cleaning out cellars or from remodeling and renovating, are picked up by special trucks on request.

The number of dwellings and business places to be served increases steadily. In 1954, over 4200 new units were added within the city limits. In the business section about 250 were added. No additional employees were taken on. The situation compelled a complete new study of the system. It was found that the average pick-up time per unit is four minutes, and that the routes average from 2700 to 2800 units. The working force was already divided between three sub-stations, but now some routes were changed, some personnel was shifted, and other changes were made to equalize the work.



● **DUMPING SIDE of the incinerator, where an average of 750 tons of refuse is discharged each day. Steam generated by the plant is sold to Georgia Power Co.**

In 1953 Dempster Dumpster containers were given a trial. They proved so satisfactory that more commercials want this type of service. Enough are now in use to warrant the purchase of the complete collection unit to serve them, and a trailer, truck and lift are being put to use. Many requests for these units come from places where large numbers of people are to be fed. Churches, the Shrine Circus, fish fries, and barbecues by the American Legion and similar bodies have had the Dempster units placed for them, and their experience has been good.

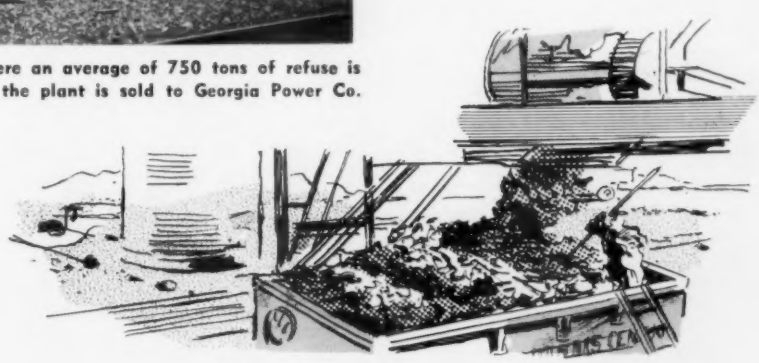
Private Collectors

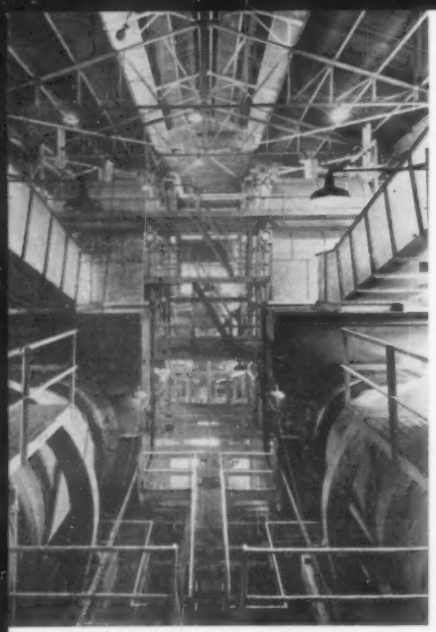
Considerable trouble was experienced here as in other cities because commercials hauled their refuse to the incinerator or the land fills in open-top trucks. The city passed an ordinance three years ago requiring all commercial haulers to cover their trucks with tarpaulins or to employ some other method that would stop the blowing of papers and trash. Now every establishment hauling its refuse must get a permit from the Sanitary Department to make him comply with the city law. If a refuse hauler is taken in for carelessness, and does not have a permit, he is fined $50.

The assortment of stuff which the city collects and turns into revenue is amazing. Tires are welcomed, battery boxes burn well, small limbs cause little trouble. Crates, miscellaneous containers of various materials, rags, bones and bottles—all go through the fire and make more steam for heating department stores and office buildings.

Refuse Disposal

What makes this department most distinctive and beneficial is the means of disposing of the waste. This is a Volund incinerator, the first of its type to be built in this country. It was originated in Copenhagen, Denmark, and is marketed here by





● **INTERIOR of the incinerator, looking toward discharge end of the building, showing two of the four rotary kilns.**

International Incinerators, Inc., in Atlanta. Because it is the first one, its performance has been under constant check and observation. One proof of its effectiveness is the plan to build another one at the north end of Atlanta near the two units of the water department. It will make steam, mainly for pumping, at an estimated saving of $80,000 to $90,000 a year now spent for fuel.

The first unit of the downtown plant was built in 1940, with a capacity of 350 tons per day, at a cost of $550,000. The second unit was built ten years later, with the same capacity, but cost $1,350,000. There are four rotary kilns, one standing by but coming into more and more frequent use to handle peak loads. Everything points toward the need for an increase in total capacity. Both of the present units were built with funds obtained by selling revenue bonds.

Sketching the operation, a traveling crane picks up trash from the dump pit in the usual way, with a grab bucket, and hoists it into the drying chamber, which stands on the second floor. Enough heat comes over from the ignition chamber to do considerable drying. In the ignition chamber the fire is forced by a fan, and combustion is about 65 percent complete. The material then passes into one of the four rotary kilns, which are 25 ft. long and 12 ft. in diameter, revolving from one to twelve times per hour. This completes the process of combustion.

At the discharge end the sintered trash hits a curtain of water, which may account in some degree for the nature of the ash, crystallizing the carbon. It chutes into the boot of an inclined elevator, and as it comes up the water which accumulates in the boot is drained on the way to a revolving screen. Cans and other foreign material are thrown out. If no contractor's truck is waiting for the ash it is loaded into department trucks and hauled to fills.

Cans make up about 5 percent of the weight of raw refuse. They are crushed between cylinders, but not baled. The crushing knocks off most of the adhering material. They are stored through the 24-hour run, and loaded on cars through eight hours. All cans are shipped to Tennessee Products and Chemical Company at Chattanooga.

During 1954 more than 440 cars of cans were shipped, an increase over the previous year. The revenue was $104,503.22. The price was low, and the decrease in the market lessened the profit at the incinerator. Scrap metal did not sell readily, and an accumulation of 281 tons was sold at contract for $898.91.

A good deal of thought is being given to recovering tin and other metals from the residue, and it is thought that $30,000 a year could be gained from such an undertaking. The stable revenue, however, is from steam. In 1954 some 538,708,900 pounds of steam were generated, of which 440,018,000 pounds went to the Georgia Power Company for $134,229.45.

The End Product

From 10 to 15 percent by weight of raw refuse comes through as an ash residue which is a very peculiar substance. It is solid black, with some glisten; not like coal, but more like crystals. The particles are small, and are easily crushed to powder. It would be unprofitable to speculate on its form and structure except for its unusual properties. At first it was wasted in land fills. Then some of it was spread over a dirt driveway. It compacted so solidly, without rolling, as to rival bituminous pavement.

A yard was paved with it at the plant. When men tried to drill a post hole through it from a truck, it lifted the truck. No impression was made on the pavement. A rock drill had to be used to get the hole down. It is impervious to water and oil. Now it is in demand by contractors for all kinds of surfacing, and their trucks often stand in line waiting for turns under the chute.

Land Fills

Four land fills are operated in different parts of the area, usually for dry materials only. In the peak months—June, July, August and December—some garbage is hauled to the fills also. All Christmas trees, large limbs and trunks—reduced to 4 ft. in length and 4 ins. in diameter, are filling material. During the spring pruning season, and the leaf season in the fall, a great deal of loose debris is packed in. Small dead animals are buried on city property, and 40,620 were picked up in 1954.

In an amusement park there was a lake covering about 5 acres, with depths of 30 feet. It became a nuisance, with 3 to 5 drownings a year. The Sanitary Department closed it and took over the job of filling it a few years ago. It is taking a tremendous amount of refuse.

Wherever sanitary fills are used there is a question about building on them. In San Antonio much of this filling is done on private property, to reclaim arroyos and gulches for some use. Small buildings have been erected on them, without foundations. The question is answered in Atlanta. The highest TV tower in the world—at the time of its building—stands in the middle of one of the city's landfills.

The package service of the Sanitary Department is imposing, for a tax of $14. It includes the collection and disposal of all garbage and trash; burying small dead animals; sewer flushing; street cleaning; inspection of environmental conditions; weed cutting on parkways in front of unimproved property; maintaining the shoulders and parkways of the four-lane highway; sweeping the entire expressway; and sweeping the West By-Pass.

Public Approval

The best index to public attitude toward the Department is in the number of complaints. In 1947 the city was divided into 10 districts to pin-point complaints and look into the causes. A daily complaint sheet was set up for recording them. In that year there were 86 per day per district. A few years later the record showed 7 per day per district, with twice as many people being served. Recently the score was down to 14 per day for the entire city. The count for all of 1955 is expected to be from 2 to 2½ per district.

Not every sanitary department can burn its refuse to make steam, and sell the steam to a power company to heat the downtown area of a metropolis. But the department in Atlanta shows what engineering can do with resources and existing opportunities, to serve the money-conscious taxpayer. And not many hard-headed taxpayers are untouched by the aesthetic gains in clean streets, clean atmosphere, and clean premises.

Safety Program

Reduces

ACCIDENT RATE

DEAN SMITH

IT'S SIMPLE to visualize easier and less dangerous work than repairing a lonely stretch of highway on the Arizona desert, with automobiles speeding by and the summer heat over the 110-degree mark. Yet, despite the obvious hazards to which its road crews are exposed, the Arizona State Highway Department reports important strides toward making these jobs safer. It has been done through a department-wide safety program administered by Joseph Pond and his Adjustments Department.

Pond's office, primary duty of which is to process cases in which Arizona Highway Department property has been damaged, was assigned the safety program in November, 1954. Since that time, the 2,000 employees of the highway department have become unusually safety conscious. A department survey at the end of 1954 showed that 288 employees had been injured in a wide variety of accidents during the year. The loss in man-hours was 13,624 and employees sustained a loss of $25,177.15 in pay over and above the normal paid sick leave granted each employee.

Although complete figures on accident rates during 1955 will not be available for several months, it seems sure that the Arizona Highway Department will post a much better record than in 1954.

Take the case of the approximately 500 men who work on road crews, for example. Exposed to traffic as they are, it was understandable that six of these men were injured during 1954—one of them fatally and another seriously. Yet, during the first nine months of 1955, only one road crew injury was recorded and

that man was hospitalized only briefly.

Much of the credit for the reduction in accident rate for these men must go to the inauguration in March, 1955, of the red smock program. Bright red smocks are now worn over their work clothing by men who work on the open highway in any capacity.

Mr. Pond first became interested in the red smocks when he was driving through California en route home from a vacation trip. Rounding a curve, he spotted a red-smocked flagman on the highway far ahead. "I saw the color of the smock before I saw the man," he said, "and I decided then that it was a wonderful way to protect our personnel."

The Arizona Highway Department bought enough percale for 100 smocks and ordered them made up by a Phoenix seamstress. Each smock requires two yards of material, at 28.5 cents per yard. Total cost, including labor, was $1.25 per smock.

"We considered bright red shirts, but decided that the problem of fitting each man would be a difficult one," Pond explained. "If a man got the idea he didn't want to wear one, it would be easy for him to say he couldn't get a shirt to fit. The smocks fit anybody."

As expected, many men on the road crews objected at first to wearing the gaudy smocks. But foremen were given strict orders to require every man to wear one while on highway duty, and the

● **ALL MEN exposed to traffic in the highway department striping crew wear red smocks as a safety measure. Umbrella gives protection against Arizona's hot sun.**

● ARIZONA Highway Department road striping crew is provided with red smocks and safety truck with warning sign.

smocks now are accepted as a matter of course. To insure that each man has a smock available at all times, two are issued to each man working on the highway—one for wear and one in the wash.

Some experimentation is going on also with red hats to supplement the smocks. An inexpensive straw hat is sprayed with red paint to give added protection to men working in traffic conditions.

Other Safeguards

In addition to red clothing, the Arizona Highway Department uses many other safeguards. Caution signs are posted well in advance of each crew and flagmen are stationed where curves reduce visibility. Highway striping crews get the added protection of a highway patrolman driving alongside.

The department's traffic civil engineer, Mr. Price, has insisted on one procedure with caution signs that has aided the safety program. In his trips to inspect striping and repair projects he makes sure that workman remove "Men Working" signs when they leave the highway, even for lunch or a brief break. "We find that motorists lose respect for warning signs when they find an area posted and nobody working there," he explains. "The next time they encounter such a sign they are more likely to ignore it. So we make sure men are actually working when a caution sign is posted."

In the never-ending war on accident-causing conditions, one of the principal techniques used is that of the inspection and follow-up. A member of the Arizona Industrial Commission staff makes periodic inspections of all department operations several times a year. Like an inspection of a military unit, the report lists equipment conditions and personnel practices which might cause accidents. For instance, grease or litter on a floor can cause a fall. A worn piece of equipment can fail and seriously injure its operator. Oiling or maintaining rock crushing equipment while it is running is an invitation to an accident.

The list of injury-causing conditions has been a long one, and new ones will crop up from time to time. The only answer is continuing inspection and making sure department supervisors correct the faults. Recommendations for correcting unsafe conditions are submitted to department supervisors after each inspection. When the supervisor has corrected the trouble, he makes a report on his corrective action to Mr. Pond's office. Follow-up checks make doubly sure the unsafe conditions have been removed. Special care is taken to indoctrinate new personnel in safety education. But the old-timers need occasional reminding, too.

● CONSTANT attention to safety has nearly eliminated accidents.

ELLIPTICAL LINERS *Save Time* on SEWER CONSTRUCTION

A. J. MAIR

SEWER CONSTRUCTION forces and municipal engineers are faced with a two-fold problem every time they undertake a trunk sewer job in a built up area. How can they operate an efficient job and at the same time cause as little inconvenience to traffic and surface use as possible? The City of Edmonton in western Canada has tried a method of attack unique and first results are very encouraging. The problem of trunk sewers through established areas running overloaded and needing relief is a common one. Construction of these new lines usually means tunnel sewers being built under busy streets, and any way to speed up the work is always welcomed.

The principle of deep tunnel construction using 'liner plates' and building the sewer line as the tunnel was pushed forward had been tried and proven in the area. A local concrete pipe manufacturer furnished materials that combined some of the favorable construction features of liner plates with the benefits of concrete pipe.

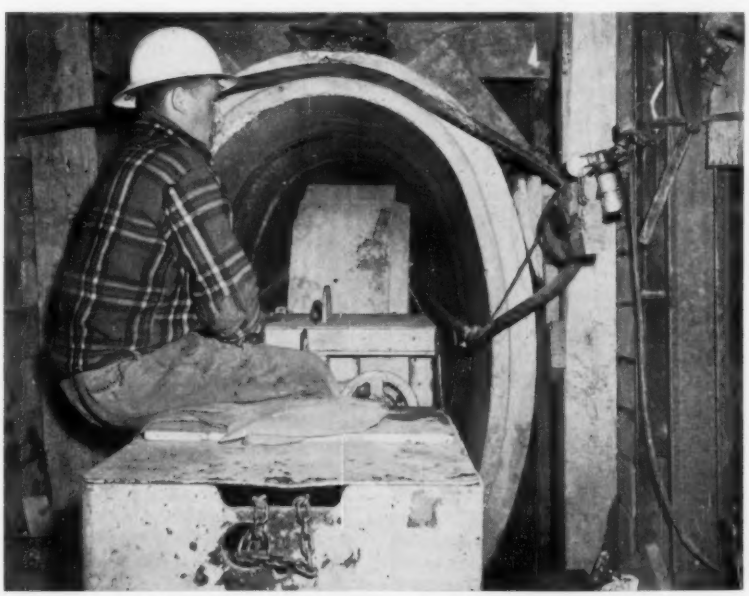
The basic idea is a piece of pipe, manufactured in short lengths, elliptical in shape and carefully dimensioned so that when tipped on one side and raised to the center of the sewer, it will travel through another pipe of the same size without touching at any point. The operation is made simpler with the aid of a specially constructed and patented jig for handling the piece to be installed.

Shafts are sunk as in ordinary tunnel operations, and a heading driven in the direction the proposed line is to go. After the first section of elliptical pipe is installed, tunneling operations are carried out from inside the pipe already laid. It has been found that it is necessary to carry the excavation far enough ahead of the last pipe in place to allow room for the new piece to swing ninety degrees vertically and ninety degrees horizontally. Allowing for the curvature of the pipe this amounts to roughly the vertical height of the installed pipe. This obviously assumes good ground conditions, but suitable methods for dealing with poor ground have been evolved and used.

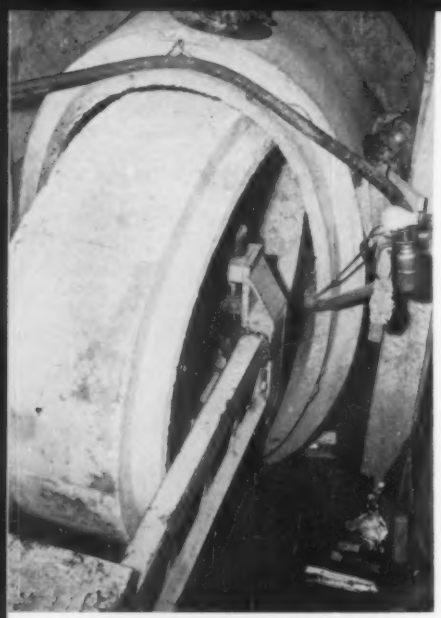
Another limiting factor immediately arises. The pipe has to be big enough for a man to work inside it. It has been the experience locally that most sewers which are deep

● **WORKMAN** excavates at the tunnel face. Track extends to last liner.

● **HEAD-ON** view of a pipe section as it enters the elliptical tunnel.



● **COMPACT** electric locomotive transports pipe lining sections as the tunnel is extended. A special rig grips the pipe from the inside and turns it into position.



● **CLOSE-UP of the rig that guides and positions tunnel lining sections.**

enough to necessitate tunneling are of the trunk or interceptor class, and are of a size which permits this type of operation. Elliptical pipe equivalent in size to a 42-inch circular pipe, or larger, is adaptable to this method of construction.

A battery powered tractor runs on tracks laid along the invert of the completed line. A special jig, mounted on the front of the unit, handles the individual pieces of pipe in the line, and this same tractor unit hauls cars loaded with excavated material to the shaft for removal. No difficulty has been experienced with these tractors, which have been operated under very adverse moisture conditions on some locations.

Shaft spacing varies with the depth of the line and the requirements for manholes, connections and other appurtenances, but it has not been found necessary to limit the length of tunnel due to the method of construction.

One of the first jobs of this type carried out in Edmonton was in the downtown area a few blocks from the main business district. The street under which the sewer was being laid was a quiet one and was barricaded off at both ends. Had it been necessary to keep the street open to traffic, this could have been done with little inconvenience to either traffic or construction, as the surface operations were limited and the only problem would have been storage of pipe. Subsequent jobs have been in more outlying districts, and the advantages of limited surface activity were not so important.

It is felt that in congested areas where it is necessary to maintain traffic flow, this method of construction would be the most suitable that could be adopted.

From the cost standpoint, the advantages of elliptical pipe are apparent. Under good ground conditions no timbering is necessary, thus eliminating one costly phase of the average tunnel job. Since excavation is carried out to roughly the cross section of the pipe to be laid, backfilling is reduced to a minimum.

Starting out with crews unfamiliar with this type of pipe, some difficulty was encountered in maintaining line and grade, but after a short period, it was found that the men were able to maintain a 0.3 percent grade with ease and a comparable line.

One of the first difficulties encountered was making adequate provision for the various lines which have to be carried to the face of a tunneling job, such as fresh air, light, discharge lines from pumps when water was encountered and so on. The actual clearance between the wall of the completed line and the edge of the new piece of pipe travelling through the line was so limited that considerable thought had to be given to the location of these other lines before trouble-free operations were carried on.

A definite limiting factor on the radius of curve which could be run underground was encountered with this small clearance. Since any change of direction usually occurs at a manhole, this problem was not too serious.

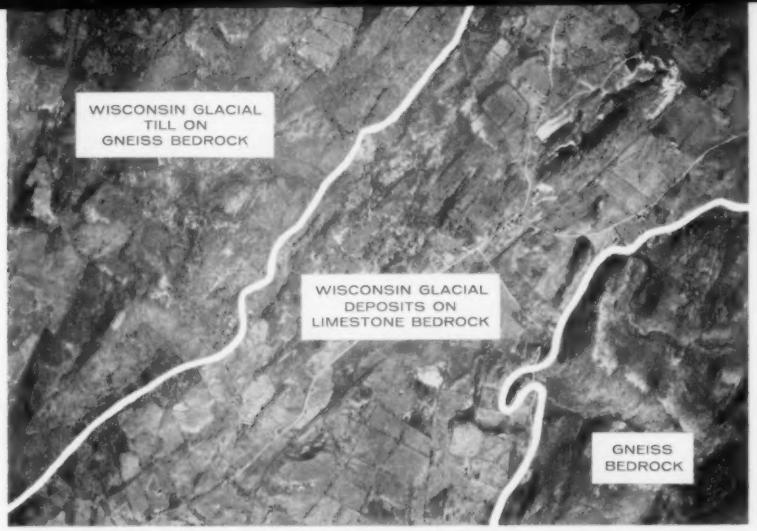
The pipes are manufactured in individual forms, poured and vibrated in the form. The manufacture is a simple operation requiring little in the way of specialized equipment. One of the main requirements is a fairly large working area to allow the sections to cure and still leave enough room for manufacture of new pieces.

The pipes are cast with a hole on either side at the springing line. These holes are used in handling the pipe and are positioned to fit the attachment on the front of the tractor for handling in the line itself. The holes are grouted in when the line is completed.

Generally speaking, this method of construction cannot compete with open cut methods for equivalent pipe sizes. However, when a tunnel job is called for, either because of depth or traffic problems, the experience of the City of Edmonton to date would indicate that elliptical pipe can save money and give a faster job.

Aluminum Poles Cut Maintenance Needs

The three-mile Tappan Zee Bridge, spanning the Hudson River at one of its widest points, is one of the last links in the 427-mile New York Thruway. To eliminate light pole maintenance on the structure, the New York Thruway Authority installed 220 Hubbard Aluminum Co. tapered aluminum alloy lighting standards. Thirty-five special aluminum lighting brackets were mounted on the structural work of the middle span. The poles and brackets are corrosion resistant and require no painting. This newest link in the New York Thruway system is the most concentrated, over-the-water lighting installation in the world and gives excellent visibility to the motorist.



● **FIGURE 1.** This airphoto, taken in a glaciated region, shows three broad zones or groups of materials, each of which appears with a typical pattern. Farms are evident where a glacial deposit overlays the limestone bedrock.

ENGINEERING SOIL AND GEOLOGIC INTERPRETATION *of Airphotos*

DAVID M. GREER and WILLIAM W. HOLMAN, Greer Engineering Associates, Montclair, N. J.

THAT ENGINEERING soil types and geologic deposits can be identified and mapped by aerial photography may be surprising to the uninitiated. However, such interpretation and mapping can be quite accurate, and much detailed information can be provided in a relatively short period of time.

The principles of materials identification are based on observations gathered from numerous fields of study and research, including engineering, geology, geomorphology, physiography, pedology, ecology and agriculture. It is an easy task to visualize the outline and the overall appearance of a baseball diamond as viewed from the air. Identifying the area as such, it is possible to interpret the reasons for and the uses of the surrounding structures such as parking areas and transportation facilities. In a like manner, a trained airphoto interpreter or photoanalyst can identify an alluvial outwash plain; and, depending upon specific conditions, can then interpret the soil type and its textural distribution; its horizontal extent and possible vertical variations; overall drainage conditions; and many other associated facts. The photoanalyst has been trained not only to recognize such geologic deposits but also to understand their method of formation, mode of occurrence, structure, and possible economic value; and to relate soil development and land use to the conditions present.

Just as a baseball diamond appears as a significant pattern on airphotos, the various soil types and geologic deposits also reveal specific airphoto patterns. There are a number of elements that combine to form such an airphoto pattern. For a particular area, each of these elements is carefully studied on vertical airphotos by the interpreter. To enable him to study the ground surface configuration on the airphotos in three dimensions, the interpreter employs a stereoscope of one type or another. He is thus able to determine relative height and can delineate the hills and ridges from the valleys and low areas. Some of the elements that he uses to help identify the overall airphoto pattern of a soil type or geologic deposit are as follows:

Land Form: The form of the ground surface or topography is probably the most important and revealing element of the airphoto pattern. By identifying the land form and the particular topographic relationship of an area, it is possible to narrow the range of materials that may be present. For example, it would be unlikely for a bed of boulders to be present in a sand dune.

Surface Slope: The prevailing ground slopes are generally a function of soil texture with the more granular materials assuming the steeper slopes. Consolidated bedrock areas can be considered in the same light. A soft shale or silt-stone has smoothly rounded slopes, whereas the slopes of a resistant quartzite or conglomerate are steep and sharp-edged.

Erosional Features: The presence of gullies, their shape and side slopes, their orientation and changes in direction, and their relation to other erosional features, help to form the airphoto pattern. For example, the numerous, softly-rounded gullies of a clay area seem to terminate where they encounter sand deposits; or they may abruptly

change their direction because of subsequent hard bedrock control.

Surface Drainage: Surface drainage is the result of precipitation, percolation and runoff. The type and the intensity of the drainage pattern are governed by the permeability of the soil and the prevailing slope of the ground surface. Surface drainage is at a minimum from a granular river terrace; as a contrast, in certain areas of wind-deposited silt, the dendritic drainage pattern is intensely developed.

Vegetative Cover: Certain plants tend to grow best in specific types of soils and in associated conditions of drainage. It is possible, therefore, to correlate the type of vegetative cover, its intensity, and its pattern with soil texture and soil profile development. Certain conifers prefer well drained sandy areas whereas the red maple thrives best with a large supply of moisture.

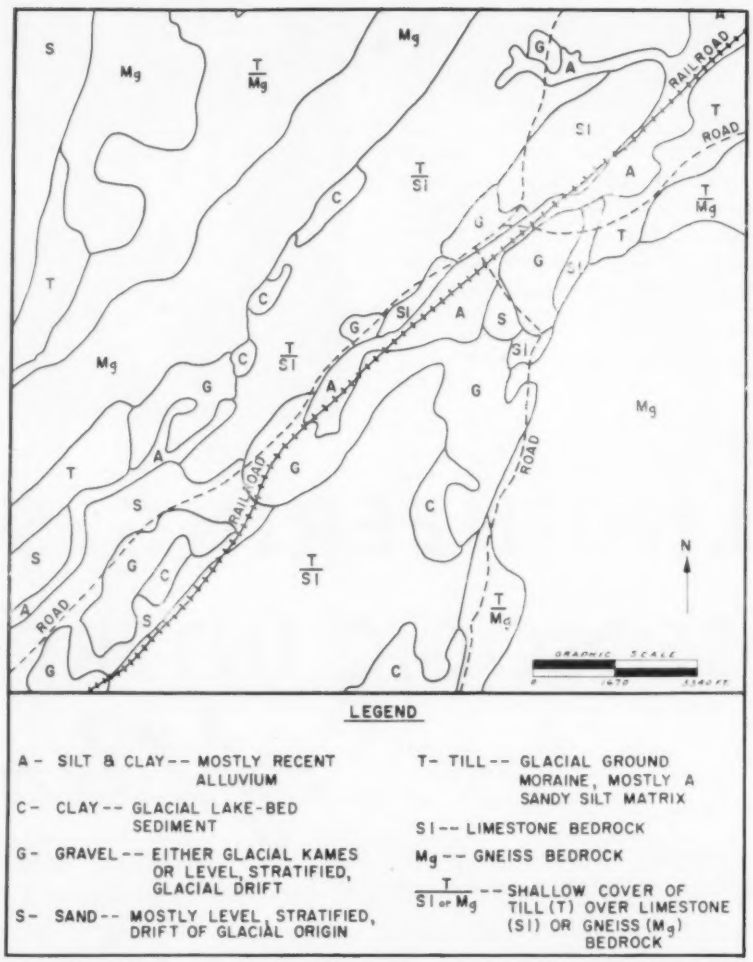
Color Tone: The color tones evident in airphotos present indirect information on soil texture, drainage, vegetation and other items. These photo color tones are various shades of gray and occur in a particular arrangement or color pattern. Areas of glacial ground moraine, soil developed from weathered limestone, and certain marine sediment each has a characteristically different mottled color tone pattern.

Land Use: The use that man makes of land and the manner in which he prepares land for a particular use may be of considerable aid to the interpreter. Steep-sided hills of basalt, having a very thin soil cover, are left wooded whereas glacial lake-deposited organic silts are farmed intensively with certain types of crops.

Many of the elements that make up the airphoto pattern form individual patterns of their own. In combination, these create a recognizable overall pattern for a particular soil type or geologic deposit.

Fig. 1 shows an airphoto taken of a glaciated area in the northeastern part of the United States. There are three broad zones or groups of materials outlined on the airphoto, and each group of materials has its own airphoto pattern. The gneiss bedrock area, to the lower right consists of elevated bare bedrock hills with steep-sided stream gullies. Farms are absent in this area as the soil cover is practically non-existent. At the upper left is an area of gneissic bedrock with a variable cover of glacial till or ground moraine. The land form and surface slopes are somewhat modified by the till cover. Both the color tone and the surface drainage pattern are affected by the mantle of ground moraine. Farms are evident where the accumulation of bouldery till is thick.

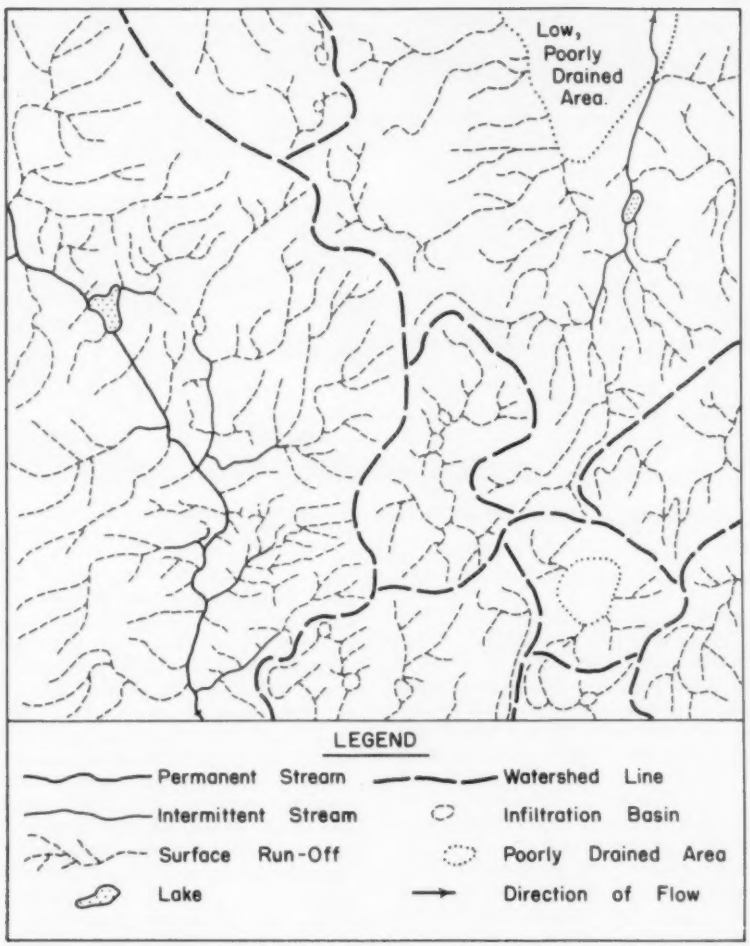
The central part of the airphoto has an overall pattern much different from the other two zones. This is a broad limestone valley with thick glacial deposits of several types heaped up in many places. The obvious presence of roads, a railroad and numerous farmed areas, suggests a less rugged land form with flatter surface slopes and a thick soil cover. The pattern elements described above are discernible on this single photograph; they are much more evident, and the boundaries between them are much clearer, when the examination is made using photographs in stereo pairs with a stereoscopic viewing device.


RAILROAD
ROAD
N
GRAPHIC SCALE
LEGEND
A - SILT & CLAY -- MOSTLY RECENT ALLUVIUM
C - CLAY -- GLACIAL LAKE-BED SEDIMENT
G - GRAVEL -- EITHER GLACIAL KAMES OR LEVEL, STRATIFIED, GLACIAL DRIFT
S - SAND -- MOSTLY LEVEL, STRATIFIED, DRIFT OF GLACIAL ORIGIN
T - TILL -- GLACIAL GROUND MORAINE, MOSTLY A SANDY SILT MATRIX
SI -- LIMESTONE BEDROCK
Mg -- GNEISS BEDROCK
T / SI or Mg -- SHALLOW COVER OF TILL (T) OVER LIMESTONE (SI) OR GNEISS (Mg) BEDROCK

● ENGINEERING soil map, Figure 2, interprets the area pictured in the airphoto on the preceding page. Many features help determine detailed material subdivisions.

Fig. 2. is an engineering soil map which shows a detailed materials sub-division of the area shown in Fig. 1. This soil map was prepared by viewing the airphoto of Fig. 1 stereoscopically in conjunction with adjacent photos, and interpreting the patterns observed in terms of the various natural materials and deposits that are present. Gravel, sand, silt, clay and hard bedrock conditions are also noted. It is possible to indicate relative soil drainage conditions as well as the soil and bedrock types for some areas.

It is evident from Fig. 2 that suitable gravel for concrete aggregate, sand for highway uses, and sufficient clay for the impervious core of an earth dam would not be difficult to locate using such a map. There is no need to search this entire area in the field for a desired type of material. A field crew could quickly investigate the several areas mapped



● **AIRPHOTO interpretation methods may be used to prepare a typical engineering drainage map such as the one shown above. No area is inaccessible to this method.**

as *G* to locate the most suitable deposit of granular material for their particular needs. Likewise, an engineering drainage map can be used to select a well drained construction site; to locate sources of surface water; to define the boundaries of troublesome wet areas; and to help in the correct location and the design of any necessary subsurface drainage system. Potentially dangerous areas of flooding and certain types of erosion can also be identified.

For purposes of area familiarization and to understand better the geologic structure, materials, and soil types in the region on which he may be working, the photoanalyst usually consults a number of technical references. The more appropriate parts of this reference material are combined with the information gained from the airphoto study to produce a highly useful technical report. This may contain an engineering description of each type of natural material in the area; notes on physiography and geologic structure; and estimate of soil depth; notes on soil profile development; suggestions as to working certain of the deposits; descriptions of possible danger areas where slide, settlement, or seepage may occur; a discussion as to the probable depth to the ground-water table; and considerations relative to the use of the various soils.

Engineering soil and drainage maps may be prepared by the airphoto interpretation method for both developed and wooded regions. No area is inaccessible. The detail of the mapping and the scale of the completed maps can be varied to suit their specific purpose.

The use of airphotos to prepare engineering soil and drainage maps does not eliminate the need for detailed foundations and soil investigations, which may include shallow and deep borings, laboratory testing, and careful analysis. Airphoto maps are a worthwhile supplement to such studies and extend their usefulness greatly by defining the limits of the distribution of the various materials encountered during the field investigation. When prepared in advance of the field investigation, airphoto maps are particularly useful in planning the scope and the extent of such work. Airphoto studies can eliminate unnecessary borings and thus save time and money.

The more obvious uses of engineering soil, drainage, and geologic maps which can be prepared from airphotos, either alone or in combination with various types and degrees of surface examination include:

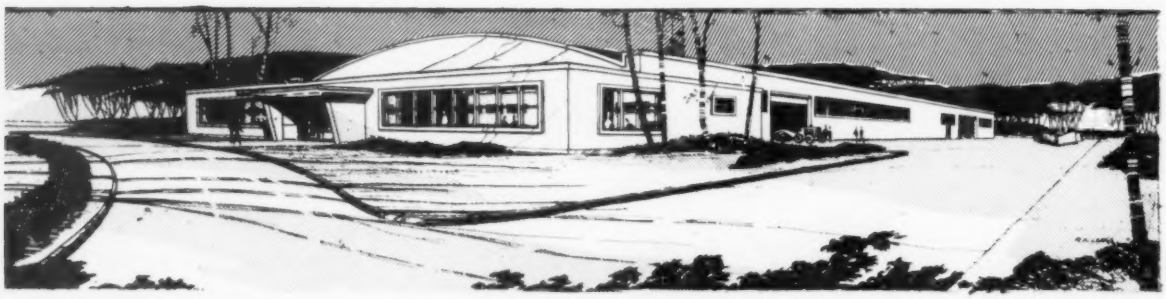
Natural Materials Surveys: An extensive area can be surveyed quickly and accurately for the purpose of locating commercial or usable deposits of sand and gravel, other granular soils suitable for road construction, impervious materials for building earth dams, material for riprap, and other aggregates. An airphoto materials survey may indicate sources of materials in unsuspected areas. When made prior to field reconnaissance, the airphoto survey can limit the field investigation to those areas containing suitable materials, with substantial savings in exploration expense.

Reconnaissance for Proposed Highways: An engineering strip map can be prepared which shows the various soil and rock outcrops in the general vicinity of a proposed highway alinement. An accompanying technical report, discussing the general geology and describing the specific soil and rock units, assists the highway designer in avoiding areas where natural conditions would hamper construction or cause undue expense.

Regional or Site Planning: This includes residential and city planning, proposed industrial sites, roads, housing, parks and a variety of other applications. Engineering soil and drainage maps can be prepared to various scales as required for the project under consideration.

Other Applications: Some of the additional applications of soil, geology and drainage maps prepared through the interpretation of aerial photographs are: reconnaissance for railroads; planning for pipe lines; investigations for the foundations for structures; surveys for transmission lines; ground-water investigations; and studies for the recharging of water-bearing geologic strata.

STAGE CONSTRUCTION USED FOR COUNTY HIGHWAY SHOP



● ARCHITECTURAL sketch prepared by Harold A. Hansen & Associates showing appearance of building when completed.

E. M. POTTER, Highway Commissioner, Douglas County, Wisconsin

A MUCH needed highway shop is in the process of construction by the Douglas County (Wisc.) Highway Department. The financing of the project was rather unique, in that the county board of supervisors wished to avoid any sort of bond issue. This, coupled with the fact that the department's machinery fund was low, as we think it properly should be, created an opportunity for promotional ingenuity along financial lines. During the past several years it has been the practice of the county board to levy, for highway construction, to the limit allowable under the statutes of the state of Wisconsin. This was done for the purpose of developing the county highway system over and above necessary maintenance expenditures. This we believed to be sound management. It was therefore suggested to the county board, by a very alert highway committee, that the highway department cut back its proposed levy each year for highway construction, from the statutory limit for a period of four years, by $50,000, thus making it possible to levy $50,000 each year for the proposed project without increasing the over-all county levy expenditures. It would be a pay-as-you-go proposition. This proposal proved to be the answer to the financing of the project.

In November, 1953, $50,000 was levied, as the first increment of the fund for the beginning of the construction of the shop. Late in 1954, contracts were let to the Widness Construction Company, of Superior, Wisconsin, for the entire foundation. In November, 1954, another increment of $50,000 was levied, thus making a fund available of $100,000.00 to December 31st, 1954. Early in 1955 the foundation was completed. Contracts were then let for the shop and the storage part of the building, the office section being left for construction at a future date, when more funds could be made available under the Financing Plan.

As a result, the shop and storage section of the structure, a building 80 x 200 feet in area, was ready for occupancy early in 1956.

At the budget session, in November 1955, another $50,000 increment was levied, making a total of $150,000 available as of January, 1956. This amount, it is planned, will cover the construction of the shop and storage space. In November, 1956, it is planned to levy enough, probably about $30,000 to finish the office section during the year 1957. The over-all cost of the structure will be approximately $175,000 according to the estimates of Harold E. Hanson, the architect, of Superior, Wis.

The new shop is located in the city of Superior, on the outskirts of all present housing areas and next to a railroad. Several sites or locations were originally considered, some of which were nearer to the center of the county. However, it was felt that the advantages of being in Superior outweighed the disadvantages. The city of Superior, together with the city of Duluth, Minnesota, which lies contiguous to Superior, comprises a metropolitan area of approximately 140,000 people. This means, that having the shop in or near the city would allow the highway department to keep a low inventory of parts and supplies. Everything one can possibly think that a highway department might need, in the way of supplies, can be acquired in this area, such as machines, machine parts, oils, fuel, tires, sand, gravel, cement, salt, calcium, metal and concrete culverts, creosoted piling and timber, steel shapes, hot asphalt road oils and numerous other items. Our situation is fortunate in this respect.

The fact that the employees of the shop and office would have an opportunity for better living conditions in the city, compared to other locations, also carried some weight in the selection of the adopted location. Schools, libraries, churches, entertainment—all these items are conducive to better employee morale. In addition, the site chosen had all utilities within close reach.

The building site is an eleven-acre tract of land immediately east of the Soo Line Railway, in the City of Superior. Practically the only disadvantage to the chosen location is the fact that highway department machines, located in outlying districts, have to travel longer distances for repairs. It was felt that the mobility of present day highway equipment, combined with its fine durability and performance, mitigates or lessens the need of having the shop situated close to the machine.

The shop will be built entirely above ground, except the furnace room which will be partially underground. The footings and floor will be constructed of concrete. The walls are to be of concrete block.

The roof will be supported by 80-foot structural steel bowstring trusses which in turn will be supported by steel I-beam posts. The roof covering will be of insulated aluminum sheets. The heating plant will be low pressure steam developed by oil combustion.

The office section of the building will be constructed entirely above ground level. The walls will be of concrete block faced with ornamental brick.

With the completion of this project, Douglas County will have a modest but attractive highway shop, adequate for all present needs, with provision for future development. The structure can be lengthened, in case of need, indefinitely. The one-story office, to be located in front of the shop and facing the street, has been so designed that another story can be added if the need arises.

The need for expansion may come sooner than we think, as the possibilities for the future of the Duluth-Superior area are tremendous. The Canada-Sarnia oil pipeline, which now crosses within the city limits of Superior, has already attracted two oil refineries to the area. This, coupled with the fact that natural gas will be available within a short period of time, will give great impetus to the development of our county. The coming St. Lawrence Seaway will further enhance the development of the Head-of-the-Lakes area.

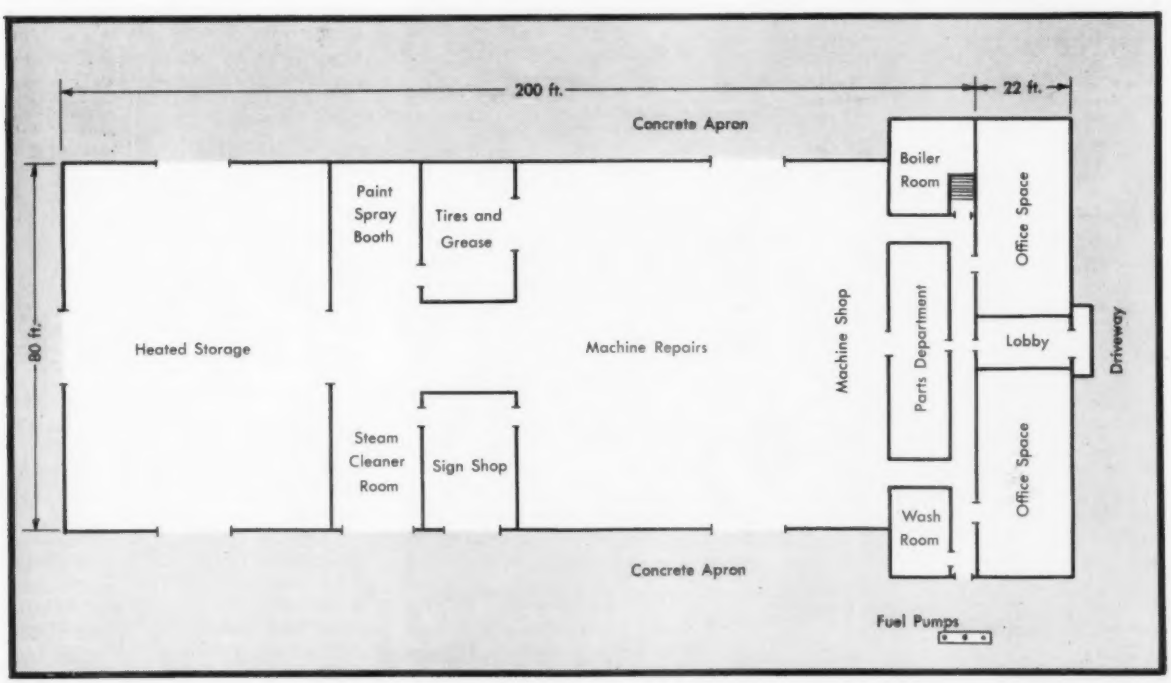
● **INTERIOR of shop during construction, showing trusses and roof construction.**

Building Details

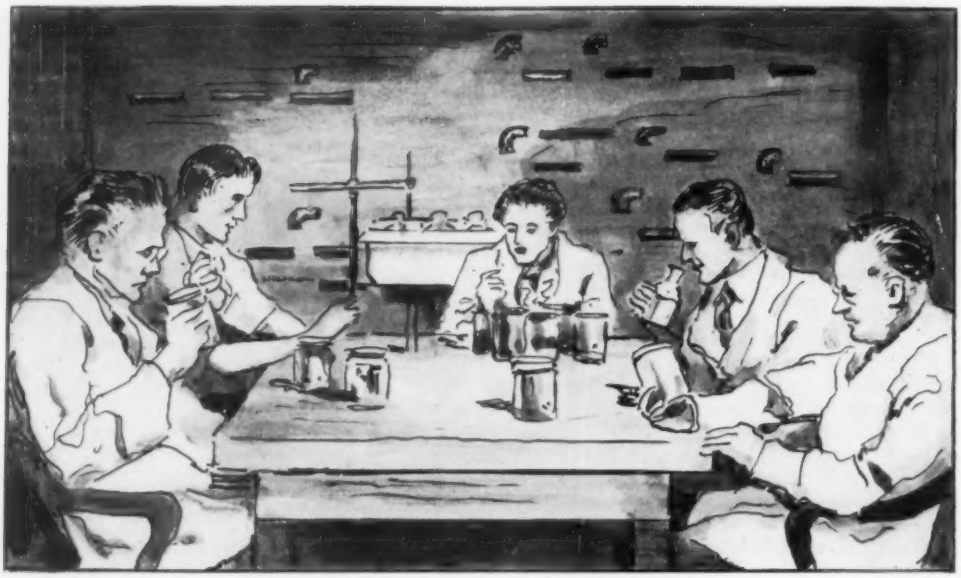
The wall footings are 2 ft. by 12 ins. and the bottoms of the footings are 6 ft. below floor level. Walls are 12 ins. thick and the floor 8 ins. There is 18 ft. 6 ins. of head room in the shop and working areas. The roof covering is 0.032 (20-gauge) Reynolds. Aluminum placed on Butler trusses and frame. Insulation is 2-in. #75 density Owens-Corning fiberglass, with scrim reinforced aluminum foil vapor barrier. Outside doors are 16 ft. wide.

There will be installed in the machine shop a lathe, drill press, grinders, 5-ton Austin-Western mobile crane, air compressor and parts washers, plus numerous small tools and machines.

A trip by the reader of this article to the Head-of-the-Lakes County during the summer of 1956 will open vistas to him and create memories of a section of our United States that is going places. When you come, take a look at our shop.



● **FLOOR PLAN of the Douglas County Highway Shop. Overall cost of the structure will be approximately $175,000.**



● TESTS on plastic pipe materials included taste and odor examinations, made by a selected panel.

A STUDY OF PLASTIC PIPE FOR POTABLE WATER SUPPLY

WALTER D. TIEDEMAN, M.C.E.
Executive Director,
National Sanitation Foundation Testing Laboratory

DURING THE past three or four years an extensive study has been carried on by the National Sanitation Foundation at the School of Public Health, University of Michigan, to determine the suitability of plastic pipe for the underground transmission of cold water for drinking water supplies. By "suitability" we mean freedom from toxicity and from deleterious effects on the water such as encouragement of growth of organisms, introduction of discoloration, tastes or odors, or interference with maintenance of chlorine residuals or with the disinfection of pipelines. By "plastic pipe" we mean the 22 formulations included in this study. An effort was made to include all types in common use for drinking water plus a few experimental samples. The results of the study show that plastic pipe of the types commonly recommended for use with potable water supplies is satisfactory for such use and does not make the water toxic, unsightly, unpalatable, nor introduce difficulty in maintaining chlorine residuals nor in disinfecting new pipelines.

This study was designed to answer a fundamental question as to whether, from the standpoint of maintaining the quality of the water and adequately protecting the public health, designing engineers should consider the use of plastic pipe in potable water supplies. Some have declined to use it either on their own initiative or on the advice of state regulatory officials, largely for want of this basic information. Secondarily, designing engineers also are interested in the physical characteristics of various types of plastic pipes. This is being covered by a separate study in another laboratory which also is sponsored by the Society of the Plastics Industry.

Types of Plastics Tested

The study included 3 samples of polyethylene pipe, 8 samples of pipe classified as rubber modified polystyrene, 5 samples of polyvinyl chloride pipe including Saran (a polyvinyl-vinylidene), 3 samples of cellulose acetate butyrate all recommended for water supply use. In addition, there were for comparison 3 special samples not recommended for water supply use, one of polyethylene electrical insulation material, and two of polyvinylchloride, one containing a complex lead compound and the other cadmium and barium salts. This made the total of 22 samples tested. Our full report contains an appendix which gives simple methods for differentiating these general groups of plastics by flame test and by specific gravity. For instance, polyethylene pipe floats in fresh water.

Tests were performed to determine possible reactions between plastic pipe and its use environment, particularly air, water, and soil. Similar sections of galvanized steel and copper pipe were used as controls.

Early in the work a search was made for an aggressive natural water. This work showed that Ann Arbor water which is treated and chlorinated is as aggressive as any of the natural waters of a group which was selected for such qualities as low or

(Continued on page 182)

GOOD DESIGN

Reduces Sewage Pumping Station Cost

FRANK J. McDEVITT,
President, Board of Public Service,
St. Louis, Missouri

A BOND issue for civic improvements, with the thought it would help to prevent a post war depression, was voted back in 1944 by the City of St. Louis. Among the various projects approved were two pumping stations for handling a mixture of storm water and sewage. These plants would operate at infrequent intervals during flood stages of the Mississippi River.

Horner and Shifrin, Consulting Engineers of St. Louis, were engaged to study conditions and prepare a report setting forth the results of their investigations. Later this firm was authorized to prepare detailed plans and an estimate of cost on the two pumping stations together with similar information on a diversion sewer, and changes to a number of interceptors.

Six or eight years elapsed and nothing had been done. Meanwhile there was an ever-increasing number of new homes being constructed in the River des Peres area, and the residents complained bitterly of the odors arising from the sewage overflows during flood stages of the Mississippi into the des Peres River channel. A change in the City Administration took place in the Spring of 1949. The pressure to construct this project increased immediately. Unfortunately after the war there was an inflation instead of a depression, and as a result of increased costs only the lower pumping station could be constructed with the funds available. Obviously, unless the upper station, with connecting diversion sewer could also be built, the project would not function as planned. This upper station discharges through a diversion line into a large outfall sewer: the lower station discharges the sewage into the Mississippi.

Studies were made by the City in an effort to reduce costs. Space requirements were cut to a minimum in both stations, and very simple superstructures were used, as can be seen from the accompanying photographs. Close coupled vertical pumps were substituted, using synchronous motors and variable speed magnetic couplings. This arrangement provides greater flexibility over using variable speed wound rotor motors with a limited number of speed changes.

The City conducted an investigation with the Worthington Corporation on the possibility of using automatic controls. This concern worked out a set of controls which would permit the pumps of both stations to come on and off sequentially depending on the flood stages of the Mississippi River. Changes in speed which cause a variation in the output of the pumps are automatically obtained through the mechanism of a float control, and depend primarily on the rise and fall of the float, which is located in a vertical stand pipe connected to the suction supply. A rise in the level causes the mechanism to feed greater excitation to the magnetic drive, and results in an increase of speed and also pump delivery. Conversely a reduction in level has the opposite effect, namely, there is a reduction in speed and pump output. After a pump has reached maximum speed, and the level continues rising, a second unit is started. In this event the first unit reduces speed, and both start at the minimum speed. A repetition of this action continues as additional units are needed. On a falling level the sequence of operations is reversed. The sequence of operations

● **STATION No. 2, showing 350-hp motors, reduction gears and 42-inch pumps.**

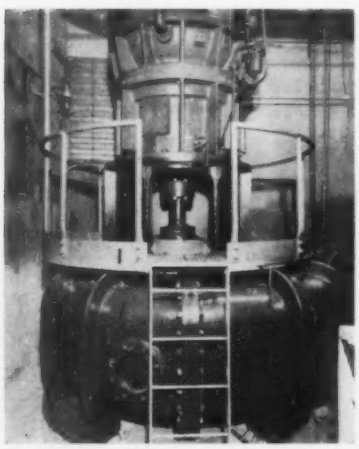
of the various pumps may be changed manually whenever desired.

The entire operation of both stations is fully automatic. This includes the starting and stopping, the synchronization of all motors, adjustment of speed, opening and closing of valves, and such other devices as are necessary for the complete protection of the units.

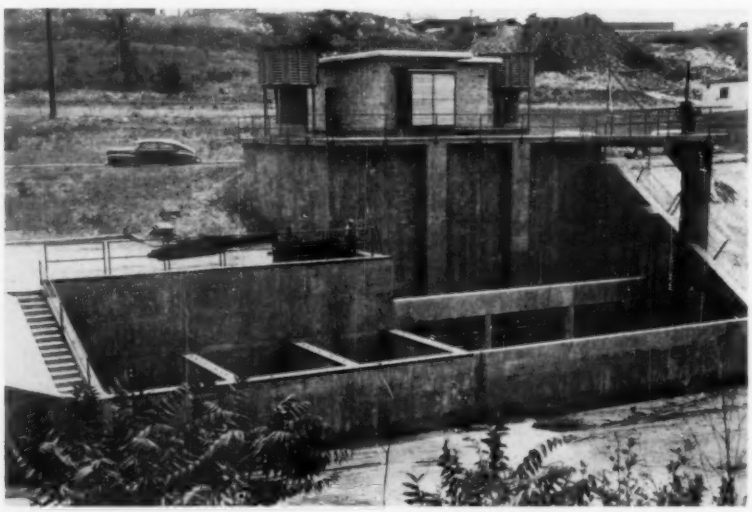
It should be borne in mind that flood stages occur infrequently and in designing these plants every effort was made to keep operating labor to a minimum. At present there is a flood control plan prepared by the U. S. Army Engineers before Congress. At certain locations along the St. Louis harbor front protecting walls will be constructed and a number of pumping stations similar to those described will be needed to handle sewage into the river. To prepare for this probability, Horner and Shifrin were reemployed by the City to prepare plans and specifications on the pumping stations along these lines.

Both pumping stations and the diversion sewer have been completed, and the interceptors are being reconstructed so they will not spill sewage into the des Peres River channel during flood stages of the Mississippi River. This work has been done within the funds originally allocated notwithstanding inflation which has taken place. Eventually, these pumping stations, together with all sewers, will come under the jurisdiction of the Metropolitan Sewer District which was created over a year ago by voters of both City and County.

● **CONTROL** panels and automatic starter boxes located in pumping station No. 2.



● **42-INCH** drainage pump coupled to reduction gear in Station No. 2.



● **PUMPING** station No. 1. Three 36-inch vertical pumps are installed here.

● **EXTERIOR** of Station No. 2, showing ventilation system and sluice gate stem.

Realistic Limitations of Flow Measurement

Rangeability and Tolerance

L. K. SPINK and R. C. TAMM

IT IS DOUBTFUL if there are any two words in the English language which are subject to as wide a variety of interpretation as the words "rangeability" and "tolerance." The application of these terms to flow meters has been a constant source of confusion to both the user and the manufacturer.

To the manufacturer, the simplest expression of flow meter calibration uncertainty is in terms of percent of the full scale of the meter. This value is most logically a constant figure, regardless of the point of operation on the meter scale, because the usual bugaboos of manufacturing are friction and lost motion, and these are likely to be as great at 10 percent of the scale as at 100 percent.

To the meter user, on the other hand, if he plans to use the meter most of the time at readings of 20 or 30 percent of the scale the calibration tolerance at full scale is less important than the meaning of this tolerance in terms of flow at his operating conditions. There would seem to be a real need for a means of expressing the manufacturer's guarantee in terms which have a useful meaning to the user.

Tolerance

The use of the word "tolerance" in the sense intended by the authors is a moot point because of the common association of this term with the machining practice in which the term "tolerance" means the maximum allowable error. However, it will be found that the Webster definition of the term "tolerance" does not tie it to a maximum value. The term has been adopted by the International Standards organization as applying to a probable variation in the coefficient of a primary device, and this seems to apply as well to the uncertainty of overall measurement results.

The Power Test Codes Flow Material Subcommittee of the ASME Fluid Meters Research Committee was given the task of assigning coefficient tolerances to different types of primary devices a number of years ago. The discussions in this Subcommittee brought out the fact that even in teaching and scientific circles there was no standard mathematical meaning for the word "tolerance." A root-mean-square value calculated from the data was used in some cases. The probable error, which means that as many of the results would be less than the probable error as would exceed it, was sometimes used. However, in scientific work the most common interpretation was the value which would insure that less than 5 percent of the results would fall beyond the specified error. The meter user is probably most interested in the maximum value, but mathematically this would approach infinity and would thus be meaningless. The 95 percent probability value seemed to the members of this Subcommittee to be the nearest mathematical approach to what the meter user wanted and was adopted.

For a starter, suppose we use the definition of measurement tolerance as the percentage within which 95 percent of the flow measurements with a given meter would fall. Without due thought given to the matter, one might say that this would be something less than the maximum error observed in the calibration of the instrument, but this is not necessarily true. Most calibrations are performed under reasonably ideal conditions in the instrument factories. Therefore it should be realized that under field operations, where ideal conditions do not always exist, additional errors must be considered. Such things as expansion and contraction of mercury with ambient temperature changes; expansion and contraction of charts with relative humidity; flow condition changes affecting primary device coefficients; and vibration effects may all cause meter uncertainties.

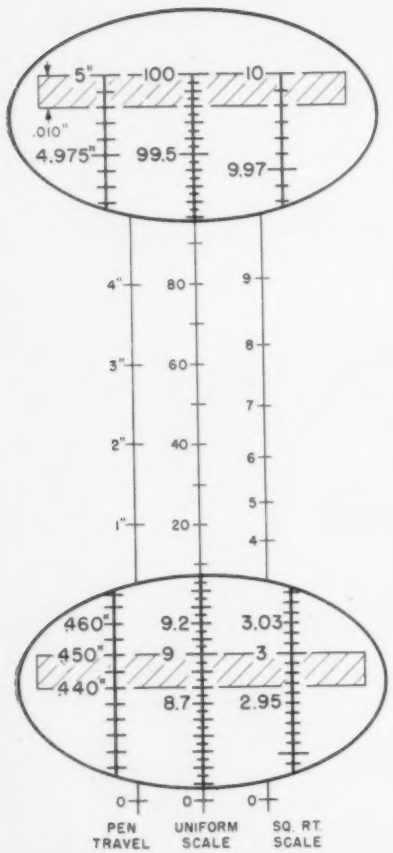
In applying this theory, if one source of error or uncertainty is highly predominant, the effect of other small sources of variation are minimized in the over-all result. At high rates of flow, the coefficient tolerance may predominate, but at low rates of flow it is quite likely that the instrument calibration tolerance will smother all other sources of uncertainty.

Rangeability

Thus, we come to the question of a definition of "rangeability." Without a clear definition, a manufacturer could claim that his meter had infinite rangeability, because it would read from zero up to full scale, and the ratio of maximum reading to minimum reading would be infinity; but we know of no manufacturer who is so unscrupulous. However, there is still a tremendous latitude for degrees of conservatism of rangeability claims. It would seem, from the user's standpoint that he is interested in the ratio of maximum measurable flow to the minimum flow at which the meter will give readings within his allowable tolerance. Thus, one user who requires a very low tolerance will have a meter rangeability of 3:1; whereas another user who is not as interested in accuracy at low readings will accept a higher allowable tolerance and will obtain from the same meter a rangeability of 10:1. Therefore, to impart a meaning to the expression rangeability, a statement of the measurement tolerance at the minimum flow rate must be included.

An intelligent study of the subject of rangeability requires a clear distinction between multiplication errors and constant errors. A pure

This article has been slightly condensed from a paper presented at the 1955 Annual Convention of the New England Water Works Association and is reprinted from the Journal of the New England Water Works Association.



● **FIG. 1. Effect of constant errors on uniform and square root scales.**

multiplication error is zero at zero flow and has no effect on rangeability. Errors caused by friction, lost motion, and similar effects, as well as by inability to detect small motions of the pen, may be just as large in terms of instrument scale at zero as at full scale. This does not mean that the error in terms of percent of flow is constant; quite the contrary. The percent error approaches infinity at the zero reading. This is the type of error or uncertainty which imposes realistic limitations on the rangeability.

This can better be understood by referring to Fig. 1. In the example a gray shaded area at top has been used to represent the possible error at full scale. The gray shaded area below represents this same error only the pen position has changed. The upper border of the shaded areas is the true reading; the lower border is the actual reading. In the example a pen travel of five inches has been used and an assumed error of .010 inch. This represents 0.2 of 1 percent of full scale. Three scales are shown—pen travel (0-5 in.); uniform scale (0-100); and square root scale (0-10).

The .010 in. error is slightly larger than the upper line on the chart (.008 in.) in Fig. 2. As the constant theoretical error is observed at the lower reading, its value on the pen travel scale remains the same — .010 in. (lower part of Fig. 1.). The value is also the same on the uniform scale—0.2, but on the square root scale the value is considerably more than the original 0.01; actually it is 0.04.

On the uniform scale the pen should be indicating 9.0 but is actually indicating 8.8. Dividing the difference by 9.0 and multiplying by 100, an error at reading of 2.2 percent is obtained. Thus, the theoretical error as a percentage of actual flow is approximately ten times as large at this low flow as at full scale. On the square root scale the pen indicates 2.96 instead of 3.00 or a 1.33 percent error at reading. The ratio of rangeability of an instrument using these lower values as limits would be 11.1:1 for the uniform scale and 3.3:1 for the square root scale.

In order that a user can determine his own rangeabilities, two formulas are introduced. If the pen travel and error, both expressed in inches, are known, it is a simple matter to determine either the rangeability or the percent error at the minimum reading.

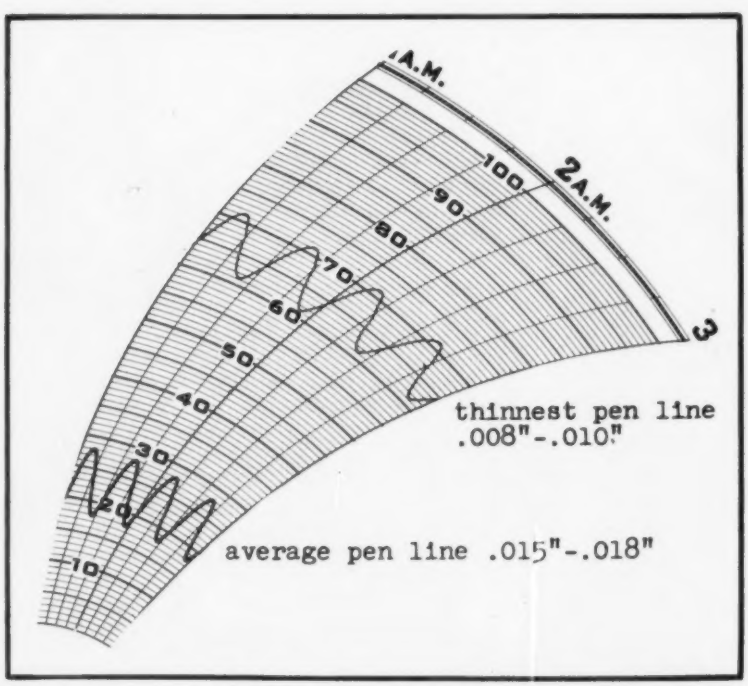
$$F = \left[1 - \sqrt{1 - \frac{R^2 e}{M}}\right] \times 100 \quad \ldots\ldots 1$$

$$D = \left[\frac{U e}{M}\right] \times 100 \quad \ldots\ldots\ldots 2$$

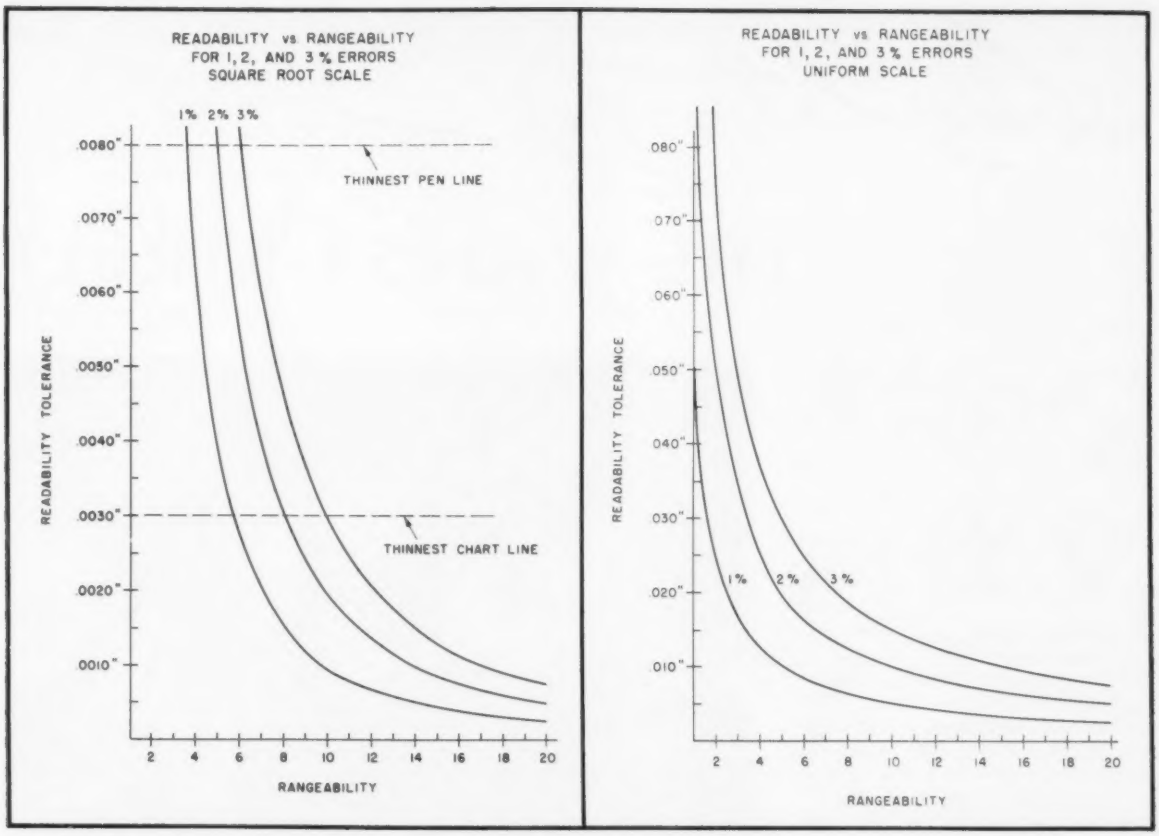
Where: e = the deviation or the actual distance in inches of the pen from the true differential reading.
M = maximum pen travel in inches measured on time arc.
U = rangeability for uniform scale.
R = rangeability for square root scale.
D = the error in percent actual flow for the uniform scale.
F = the error in percent of actual flow for the square root scale.

Using the formula for square root scales, Fig. 3 was developed. Shown are three curves representing 1, 2 and 3 percent errors at reading. These curves are plotted as rangeability vs. readability tolerance. That is how closely one must read a chart in order to obtain the desired accuracy. The dotted line at the top represents the thickness of the upper pen line in Fig. 2. The lower dotted line represents the thickness of the thinnest chart line also in Fig. 2.

As an example a man has a meter which he would like to use for a



● **FIG. 2. Thin pen lines and precise readings are needed if tolerance is small.**



● **READING errors of 1, 2, and 3 percent for the square root scale (left, Figure 3) and uniform scale (right, Figure 4).**

rangeability of 10:1. He cannot have an error at reading in excess of 2 percent. What is his tolerance? Checking the curves, it is apparent he must read within .002 in. of the true reading. It should be mentioned here the M has been taken as 5 ins., because 5 ins. is a larger pen travel than that used by any well known meter manufacturer. Therefore, the errors shown are actually less than would exist with an actual meter.

Fig. 4 shows the same information for the uniform scale.

In the matter of readability, the uniform flow scale meter has distinct advantages, but these may be highly illusory. If the signal transmitted to the pen is in error, because of zero error effects, temperature effects, or friction or lost motion, from an operating standpoint lower readability at this point on the scale might be better. All differential type meters operate from a signal which is basically the square of the rate of flow; hence, to produce a uniform scale, the signal at low flow rates, must be highly multiplied. Therefore, to the original errors must be added the errors of the multiplying means.

Fundamentally linear type meters do not have this limitation. (Orifice, nozzle, or venturi type meters are not fundamentally linear). The difficulty of maintaining tolerances in this type of meter increases only as the first power of the rangeability attempted. One might be inclined to say that with electronic multiplying means, which eliminate lost motion and can be designed to multiply the flow signal to an almost unlimited extent, the rangeability of this type of meter would be boundless. However, even in the case of electronic devices, we run into noise levels which place a definite limit on the minimum signal which can be used with accuracy.

Extending Rangeability

While this discussion has indicated limitations in the rangeability of the differential type meter, certain steps can be taken to obtain a real and actual increase in rangeability.

One of the first points to be emphasized is the importance of choosing the proper flow range for the existing conditions. All too frequently in the water works industry a meter is chosen to take care of flow rates which may not be encountered until years after the initial installation is made. It is then found that for the actual operating conditions the meter is operating barely off the zero point on the scale. Better results would be obtained if it were planned to change the primary device or the differential range at the time when the anticipated increase in flow rate became a reality.

An ingenious device for instantly changing the flow range of a meter employs three mercury chambers. By means of the piping manifold valves, one of these chambers may be switched to either the high pressure or the low pressure side of the manometer. When the extra chamber is on the low pressure side of the manometer the instrument becomes a low differential range and, when on the high pressure side, it becomes a high differential range, since the mercury must move farther for a given displacement of the float. The common range combination is 25 ins. and 100 ins. This gives a 2:1 ratio of flow capacity. When a single pump is adequate for

(*Continued on page* 138)

Lighting THE WIDEST STREET

BROAD STREET in Augusta, Georgia is 167.8 ft. wide between property lines, and is said to be the widest street in the country. Its sidewalks vary from 18 ft. to 24 ft. wide, and there is a center strip 4 ft. wide, in which are two good looking monuments. Along the two driving lanes are four curb lines for parking, inviting shoppers. It is a bright, showy business street, perhaps not equalled elsewhere for appearance and spacious convenience.

Other streets in the city compare favorably. Two have wide, tree-shaded and landscaped center parking. It is a charming city of the Old South which grew up somehow with a checkerboard street plan and plenty of room. Its area "was" only 11.16 square miles, but it is annexing fringe areas so fast that it is larger than that now. The same applies to its population, quoted at 71,000 in 1951, 93,000 in 1953, and now probably is 100,000.

It enjoys the distinction of having had General Electric make a special case study to light Broad Street 32 years ago, designing the present standards especially for the job, and installing the very latest thing in illuminating "bulbs and globes." Evenly spaced along each side of the street were forty standards, and in each enclosed luminaire were two 10,000-lumen incandescent lamps. Over many years Broad Street has been known as a well-lighted city thoroughfare.

● **CONTRAST between the old and new lighting systems is shown in this view. In the distance, a number of new luminaires have been installed in the center strip.**

Sudden Growth

But in 1947-53 Augusta had a jolt such as comes to few cities. It had reason to review many things that had been thought satisfactory. The Atomic Energy Commission built its huge plant for making H-Bombs over in South Carolina, 20 miles away, and Augusta became the capital of the world for 48,000 construction workers. The force is now down to 6,000 for operating, but the city has not gone back to its previous size or conditions. It has to remember an increase of more than 20 percent in street accidents, and a similar increase in at least the minor crimes.

Only the commodious plan of the city enabled it to receive this flood of people and supply their needs. The bright main street, even then, was inviting. Business houses rose to meet the new demands with vision and competence. As a result many of the transients who came in the rush remained to build the fringe areas which are now expanding the city.

Out of the boom came extensions of streets, new paving, more water and sewer lines, and expansions of treating plants. Along with these came a three-year plan for relighting major streets, and for extensions of lighting to new streets and areas.

The new program is well along. The city is lighting eight blocks of Broad Street, and the Georgia Power Company is under contract to modernize the old system elsewhere and extend it.

An enthusiastic trio is in charge for the city, consisting of M. P. Phillips, City Engineer and Commissioner of Public Works; R. L. "Country" Crawford, Superintendent of Electrical Affairs; and Wm. J. Kirchheim, Chairman of the Council Committee on Railroads and Electrical Utilities. W. S. Smith, Division Commercial Sales Manager, is the efficient representative of Georgia Power.

Lighting Broad Street

Broad Street now has 119 new standards. Forty of these are spaced about 130 ft. apart along each curb. On the center strip are 39 more, staggered so that each middle standard is the center of a "square" made up of four along the curbs. There are a number of openings

through the center strip for cross-streets and mid-block turning, but the spacing of both curb and center-strip standards has worked out perfectly in spite of these interruptions in the street layout.

Each standard is a Union Metal pole 25 ft. high with transformer base, and an 8-ft. up-sweep bracket. Those on the curbs have one bracket, while on the center strip they have twins. The luminaires are 27 ft. 4 ins. above the pavement.

areas toward lawlessness and street accidents.

Four bridges cross the Savannah River, two in the city and two in Richmond County. Three national highways cross these city bridges, two over 5th Street and one over 13th Street. Augusta is a hub for business in Georgia, the Carolinas and Florida, and 27 long distance motor freight and passenger lines pass through the city, most of them having offices and stations there.

● **TWICE AS MUCH light reaches the pavement of Broad Street in business section where new lights were installed. 119 standards and 158 luminaires do the job.**

The lamps are 20,000 lumen EH-1, mercury vapor, corrected green-blue, in General Electric new 400, type III luminaires. They double the amount of light formerly shed on the pavement, and light up sidewalks and store fronts. The dark spots which plagued the old system have been eliminated. The "White Way" is now really white, and Broad Street is a brilliantly lighted business street. The cost of the installation along the curb and center of Broad Street was $59,000.

As with every "Main Street," the approaches to the business section of Broad Street are a little on the low side of development. To give the general improvement of the city a quick boost the two ends of the street were lighted first. This not only gave incoming cars a pre-view of what was in store, but it gave pedestrians more protection by discouraging any tendency in these

Fifth Street bridge was lighted by Georgia Power for the State of Georgia. It carries the heaviest traffic across the river, on U.S. Highways No. 1 and No. 78, besides the steady stream of vehicles back and forth to the H-Bomb plant. It had to be lighted with about the same intensity as that of Broad Street because it is a continuation of the main traffic route through town.

To accomplish it 21 new 20,000-lumen mercury whiteway standards were erected on the sides, and four units of the same power were installed overhead. This carries the lighting of Broad Street around the right-angle turn onto the bridge, extending to the end of the approach on the other side. This cost $8,600.

A new super 4-lane highway now being constructed by the state will connect with one of the main streets, and it is understood that the lighting of Broad Street will be extended by the state into the new approach in some suitable manner.

Other Streets

Broad Street is not lighted at the expense of other streets in the business section. The planners knew the error made in some cities of leaving side streets poorly lighted, and thereby drawing their traffic into a brilliantly lighted main street. The nearby business streets have new 10,000-lumen incandescent whiteway standards, with type III luminaires replacing the old type 6,000-lumen lamps. The result is that no change has been noticed in the traffic load in any of the downtown streets.

Another wise feature in the planning was starting the program in outside streets by lighting two main streets in the negro quarter. In some cities these sections have been only partly or poorly lighted. With only a few streets properly lighted, trouble-making characters are driven back from the newly lighted streets into dark areas such as they have lived in before. There is no reduction of crime or street accidents.

Augusta's negro quarter is not spread out as in many other cities. There is no "farther back" section for disturbers to retreat to. So when two of the main streets in the quarter were lighted as brightly as comparable streets elsewhere the effect on bad characters was marked. They had to quiet down or leave. Brawls don't happen often on lighted streets.

Lighting these streets and others in the negro section is having a beneficial effect on inter-racial relations. This is one of the intangibles in such a program, but it is one you can get a grip on. When everyone is trying to find ways for the two races to live and work together, it is a stroke of inspiration to light the streets of the negroes in a way to encourage them and give them a lift.

Annexed Areas

The areas recently annexed require extensions of the lighting system as it stood at the beginning of the program. Public approval is mounting steadily and the contract with Georgia Power can be extended. People see what improvement comes with lighting, and they want more and more of it. Streets are safer, there are fewer accidents and less crime, and property values rise.

Approximately 350 new 6,000-lumen, type I luminaires, 2-way, 3-way, and 4-way are to be installed in fringe areas already annexed. These go on Georgia Power's existing distribution poles. About 23 miles of streets have been taken into the city, and over $7,000 has been spent to light them. This is in addition to converting about 1400 old 2500 lumen units to larger sizes.

Planning and Dividends

The best aspect of this planning in Augusta is that the officials know they are not through with it .They see that their city is destined to become a major industrial area and a distribution center for a large area. One of the largest concentrations of textile mills is only 25 miles away. The Savannah River Basin is under development, with 11 dams projected. Clark Hill Dam, the largest, costing $68,000,000, is complete, and will put 288,000 KW into the power network of the area, besides stopping destructive floods. The Corps of Engineers is spending $5,000,000 on locks and dams in the river, to insure an all-year channel to the sea at Savannah.

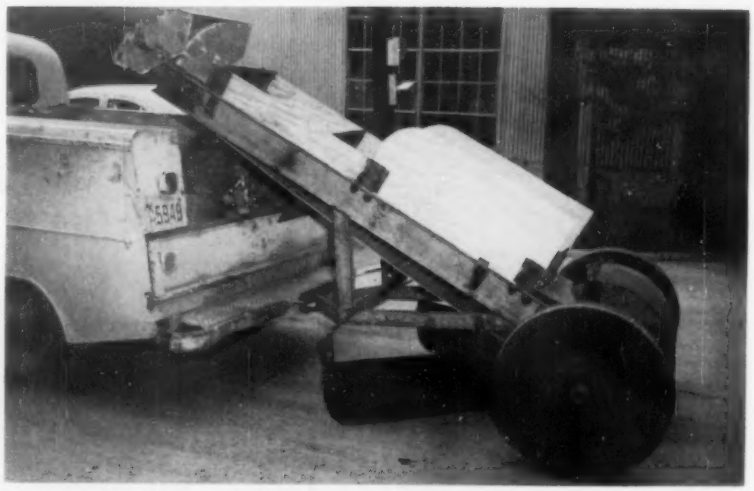
Traffic counts mount steadily, scarcely slowing down from the increase of 50 percent from 1950 to 1951, when the increase over the two main bridges was more than a third. This will compel the lighting and general improvement of more streets to spread the traffic out.

Planning officials see this coming in the near future. The lift began to show with lighting the end blocks on Broad Street, and benefits became more certain as the work progressed. One of the first expected gains is a general clean-up and brightening. Augusta is a clean city, but the better any situation is at present the more easily it improves.

From its experience with the sudden burst of crime and accidents during the H-Bomb boom, the city expects a reduction in minor street offenses. Less patrolling by the police department will be required. Alleys cannot be used as freely by petty thieves because they have to be entered from well lighted streets. Trouble in the Negro quarter will be diminished. There will be fewer street accidents, and hit-and-run drivers will find it harder to get away.

With mounting public approval, and shorter listings on the police department blotter, the city is confident that street lighting will prove to be a good way to spend public money.

Picking Up Paint Markers



● **PICKUP device is towed by a truck. Sweeps direct markers to the rear drum.**

THE BUSINESS of retrieving center line markers has always been a risky one. The use of equipment developed recently in Texas has greatly reduced the safety hazard incurred in the operation. The conveyor belt eliminates the use of personnel on exposed seats hung from trucks, and allows traffic to pass to the right of the equipment traveling down the middle of the pavement. In addition, the equipment replaces a man usually used to pick up tetrahedrons.

In general, the equipment consists of a traveling conveyor belt to which flights are attached. The belt operates between an upper drum and a pickup drum attached to a frame made from six-inch channels. The pickup drum rotates independently about the axle. Power is taken from the axle and applied through a series of sprockets and chains by which the revolutions of the drum are increased about two and one-half times. Sweeps direct the tetrahedrons into position; flights slap them into the hood covering the pickup drum, push them onto conveyor belt, and into the truck.

The equipment was first operated on the job in 1955. It picked up tetrahedrons spaced approximately 200 feet apart over seven miles of pavement and the only tetrahedron missed was outside the sweeps.

The following modifications are planned: 1) Install rollers at the top of the six-inch channels to carry the belt; 2) install a slide beneath the six-inch channels to keep the belt from flapping when operating; 3) increase the size of the upper drum to the same size as the pickup drum; and 4) make height of sweeps adjustable to compensate for the variation in hitching.

The cost of building this equipment, using as much salvaged material as possible, was slightly over $400. Texas Highway Department thinks this cost can be reduced to around $200.

This article is slightly condensed from *Texas Highways*. The author is L. D. Cabaniss.

● **REAR view shows tetrahedrons being delivered by conveyor to the truck body.**

SALT MARSH MOSQUITO CONTROL *in Kentucky*

RALPH C. PICKARD,

Director, Division of Engineering,

Kentucky State Department of Health

DURING JUNE and July, 1955, the Kentucky State Department of Health supervised and participated in the largest single mosquito control program to date in the Commonwealth. In the emergency control program involving the salt marsh mosquito, *Aedes sollicitans* (Walk.), over 15,000 acres were sprayed in Hopkins County, located in western Kentucky.

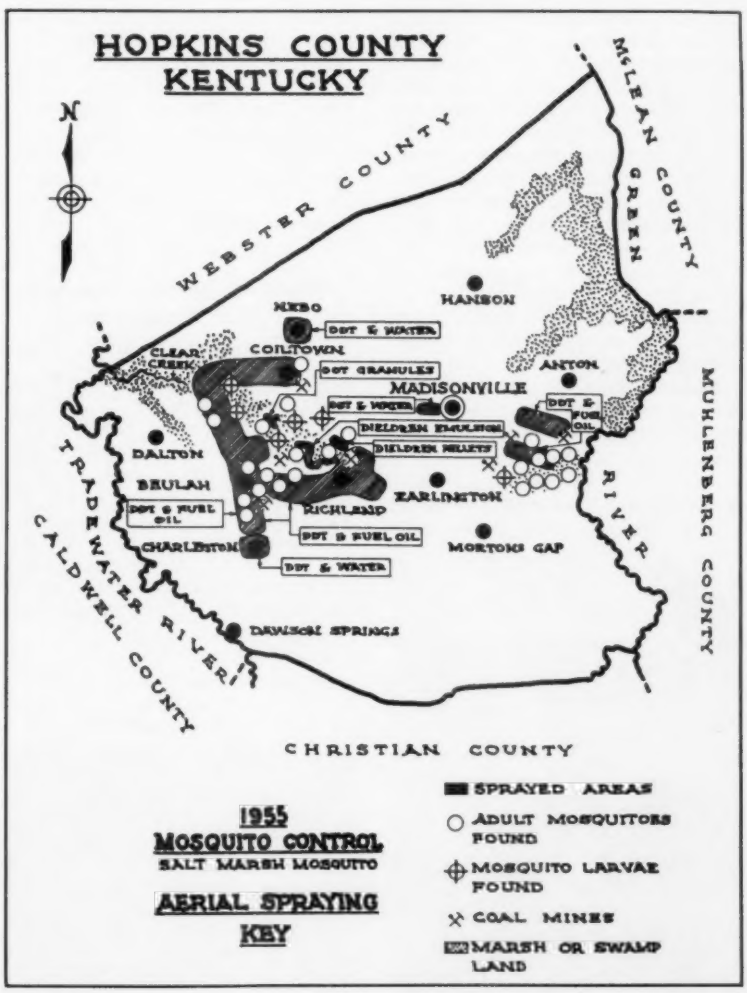
For some years, the salt marsh mosquito has presented a problem in certain areas of the Smith Mills oil well region of Henderson County and western coal fields of Kentucky. A survey by the Kentucky State Department of Health failed to indicate its presence in any counties except Henderson, Hopkins, and Muhlenberg. though Blakeslee and Payne, entomologists at Fort Knox, collected one female at that post in 1953.

In the affected areas, there was little respite day or night. In the fields and brushy areas, one could have 100 or more mosquitoes hovering about, fiercely biting. The greatest density of mosquitoes was in the Clear Creek watershed, west of Madisonville. In the past years, however, the area of the Smith Mills oil field has been of considerable concern though this year the mosquitoes appeared to have been negligible in this area. In Muhlenberg County, a few widely distributed adult specimens were collected last June but there was no evidence that a problem of economic importance was created.

The fluctuation of insect population is not always easy to understand, because of many influencing factors. This area had a wet spring season. Many of the streams were flooded. In fact, Clear Creek inundated a considerable amount of land, providing many acres suitable for breeding by successive overflow and recession. The Ohio River in flooding the oil field at Smith Mills apparently had a different effect. In this case, the substrate probably changed so as to render it unattractive for oviposition. There is also a likelihood that many eggs were destroyed by the scouring action of the flow. Then, too, the recession of the waters left a considerable number of minnows that survived until the waters began to evaporate in mid-summer. The Department of Fish and Wildlife Resources stocked the area with surface feeding minnows of the genus *Gambusia*. All of this, no doubt contributed to this year's low population density in this area.

During the aerial spraying operation of June in Hopkins County, 1708 gallons of 25 percent DDT emulsifiable concentrate and 4195 gallons of #2 fuel oil were employed. The areas sprayed were west and east of Madisonville known as Clear Creek and Flat Creek, respectively. The mixing equipment, set up at the Anton airfield east of Madisonville, consisted of three 500-gallon mixing vats equipped with feed pumps. The DDT emulsifiable concentrate and #2 fuel oil were combined to form a 5 percent DDT solution which was applied as an adulticide at the rate of 3 quarts per acre. Over the populated area, however, water was used as a diluent for spraying. In the Clear Creek area, three test plots of 100 acres each were also sprayed using DDT granules, dieldrin impregnated tobacco stalk pellets and water emulsifiable dieldrin concentrate. These chemicals were applied at the respective rates of 3, 0.75 and 0.1 pound of actual insecticide per acre.

The twelve planes used in the operation were Piper Cubs. Eleven



● AREAS treated in 1955 for salt marsh mosquito control, and insecticides used.

● A TYPICAL view of Clear Creek swamp, where salt marsh mosquitoes bred freely.

were fitted with conventional spray rigs consisting of 40 and 50-gallon tanks and fan driven pumps. The mixture was agitated by recirculation producing a pressure of 30 to 60 pounds per square inch. The spray booms, attached on the wings, possessed 13 to 20 nozzles directed backward to obtain coarse droplets. The other plane, which was used to apply the DDT granules and dieldrin impregnated tobacco stalk pellets, was equipped with a Venturi duster with a 700-pound duster tank. The insecticide was applied at a speed of 75 miles per hour, flying at treetop level or closer to the ground when permissible. The swaths were approximately 75 feet wide.

Judging from the examination of the areas sprayed, unusually good results were obtained despite the fact that the terrain was mostly hilly and did not lend itself to precise aerial spraying. However, this operation was an emergency program employed against the adult mosquito for immediate relief, since the larvae for the most part had already hatched. Later, following the fall rains, there was a slight resurgence of the mosquito population.

Enabling legislation for the development of mosquito abatement districts for long range control programs is now under consideration.

● IMAGINE all of these "skeeters" drilling into your back at one time!

• • •

Rangeability and Tolerance of Flow Measurements

(*Continued from page* 133)

normal demands, but an additional pump must be added for high-demand conditions, the meter may be kept operating in the optimum part of the scale under both operating conditions. The design is such that no mercury is trapped in any part of the system at any time, hence, the need for mercury tight shut-off valves and the need for zeroing the meter when changing the range is eliminated.

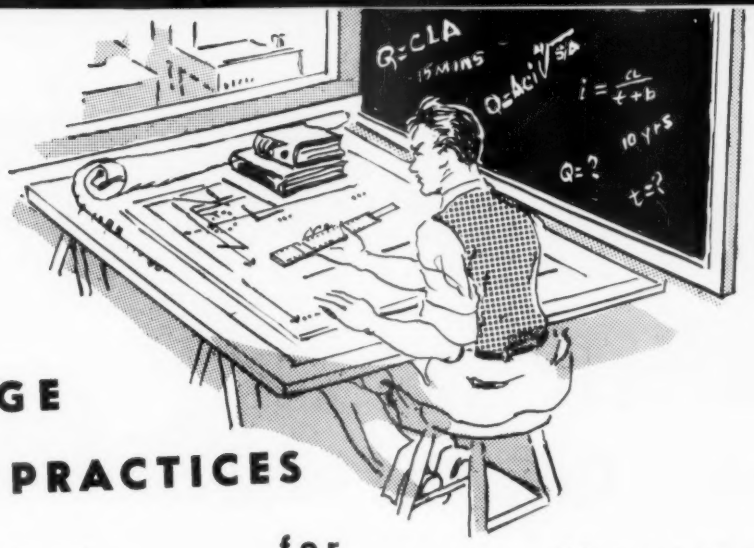
Multiple meter runs may be used to obtain a real and unlimited increase in rangeability. As the rate of flow increases, additional meter runs are cut into service to bypass part of the flow from the primary meter run, and vice-versa on decreasing flows. This operation may be performed either automatically or manually, as desired. The increase in rangeability is geometric; that is, the rangeability of two meter runs in parallel is approximately equal to the square of the rangeability of each meter. The rangeability of three meter runs in approximately equal to the cube of that of the single meter, etc.

A limited increase in rangeability may be obtained by the use of multiple recorders operating from a single primary device. The highest range which can be used is, of course, limited by the allowable pressure loss, and the lowest range by the availability of accurate low range differential recorders. A minor limitation is imposed by the variation of the discharge coefficient of the primary device at low Reynolds numbers. With the use of several differential instruments operating from a single primary device, the difficulty of integration and overrange protection is increased. If integrators are used, means must be provided for switching integrator operation from one instrument to another, as the flows exceed the successive scales of the various differential ranges, and the overranged instruments must be protected adequately against the blowing of mercury or damage to the working parts.

Rangeability statements are meaningless unless the permissible measurement tolerance at the minimum flow rates is specified. A user who can permit a 10 percent uncertainty at minimum flow rate can use a given meter over a greater range of maximum to minimum flows than one who requires 2 percent accuracy under all operating conditions.

There are three basic approaches to increasing rangeability without increasing tolerance: (1) Increasing the sensitivity to small flow signals; (2) use of fundamentally linear flow meters; and (3) use of multiple meter run installations. Under the first classification, shaped chambers and other linearizing devices increase rangeability by increasing readability and sensitivity to low flow signals. Multiple recorders operating from the same primary device provide the same advantages without some of the difficulties inherent in linearizing devices. The fundamentally linear flow meter gives rangeability equal to the square of that of square root flow scale type having the same basic signal measuring tolerance. The multiple meter run installation offers unlimited rangeability possibilities.

There is one precaution which may be taken to insure obtaining the greatest accuracy and rangeability possible with a given meter, and we will emphasize this again. Choose a flow range just as near as possible to the maximum existing flow rate.



STORM DRAINAGE DESIGN PRACTICES for CITIES

IN A RECENT questionnaire sent to a large number of cities, two questions were asked in respect to storm drainage: (a) What rate of rainfall do you use for design; and (b) What method or formula is used for design.

Since an hourly rate of rainfall in inches is used, few cities have sufficient data for design; therefore many of them use a form of rainfall rate formula, a number of which have been developed. Among the best known is the Talbot formula which has the general form $i = a/(t+b)$, where i is rainfall intensity, t is the time period and a and b are constants. For ordinary storms in the Eastern United States, Talbot recommended a = 105 and b = 15. The intensity of a 10-minute rainfall according to these constants would be 4.3 ins. per hour. Another form of rainfall formula is $i = c/t^k$, in which varying values are assigned to c and to the exponent k. Metcalf and Eddy, for Louisville, Ky., use c = 14 and the square root of t; for New Orleans, the same firm used c = 19 and the square root of t. Webster developed for Philadelphia the formula $i = 12/t^{0.6}$. A much used value for Northeastern United States is $15 \div \sqrt{t}$. This formula gives values somewhat higher than the Talbot formula with the a and b values given above.

The other important factor in computing the required capacity of a storm sewer is the amount of runoff. This is not the same as the rainfall because some soaks into the ground or otherwise fails to find its way to the storm drain. The degree of imperviousness of the area under consideration determines the percentage of runoff. This probable runoff may be computed by the so-called rational method, or it may be estimated by one of the special formulas that have been developed.

In the rational method, each block or area contributing to an inlet is examined and runoff characteristics are assigned according to the type of the surface, whether roofs, lawns, gardens, etc. The runoff coefficient for the entire area is thus determined; the inlet time is computed or estimated; and the value of t thus obtained is used to estimate the intensity of rainfall.

There are two formulas which have been used in lieu of the rational system. The best-known is the Burkli-Ziegler; one form of this is:

$$Q = Aci \sqrt[4]{S/A}$$

where q is the maximum runoff in cubic feet per second; c is the coefficient of runoff; i is the maximum intensity of rainfall in inches per hour; S is the slope in feet per 1,000 ft. along the sewer; and A is the area in acres. C is reported as ranging from 0.50 in rural sections to 0.90 in well built-up areas, with an average value of about 0.75.

The McMath formula, developed many years ago in St. Louis, has the following form:

$$Q = ci \sqrt[6]{SA^4}$$

The letters have the same meaning as in the Burkli-Ziegler formula. In St. Louis—presumably in relatively built-up areas—values of c = 0.75 and i = 2.75 were reported as satisfactory.

The following were reported to us as indicating practice in many cities. To permit comparisons, reports are presented alphabetically by States and Cities.

Alabama: Anniston, J. E. Standridge, City Engr., Talbot formula, 4-inch per hour rainfall; Mobile, Harry Fisher, City Engr., rational method, 2-inch rainfall; Gainesville, R. Sensabaugh, City Engr., 3-inch.

Arkansas: Stuttgart, H. L. Smith, City Engr., 3-inch or 10-year storm.

California: Alhambra, Charles E. Lortz, City Engr., 10 or 15-year storm; Berkeley, S. C. Jacka, Dir. of Public Works, rational method, 10-year storm; Chula Vista, E. B. Johnson, Principal Engr., rational method; Concord, F. A. Stewart, City Engr., uses the L.A. flood control district procedure; El Cajon, Robert Howes, Ass't. to City Engr., uses 1-in. per hour; Fontana, Victor Van Lint, Dir. of Public Works, uses 100 to 200 cfs per sq. mile; Hanford, Grant C. Potter, City Engr., uses the Burkli-Ziegler formula; Inglewood, Wade E. Peebles, City Engr., uses 2.75 ins./hr.; Long Beach, J. D. Gilkerson, City Engr., designs for a 25-yr. storm; Martinez, Robert B. Smith, City Engr., bases design on 1 in/hr., while Merced, R. E. Graham, City Engr., uses ½ in.; Monrovia, Fritz Zapf, City Engr., designs on the basis of 1 to 2 ins/hr., and the q = ciA formula; Montebello, P. Warwick, City Engr., employs the rational method with a rainfall of 1 in/hr.; Monterey Park, M. Carozza, City Engr., designs by the rational method for a 10-year storm; Napa, W. J. Dabel, Ass't. City Engr., and Pacific Grove, A. Coons, City Engr., base design on 1 in/hr., and Petaluma, Don Baird, City Engr., on 1.1 in/hr.; Napa uses the Talbot formula and Petaluma the rational method; West Covina, R. E. Pontow, City Engr., uses the rational method and 1 in/hr., while San Gabriel, H. B. Keebaugh, City Engr., designs for a 10-yr. storm; Santa Rosa, C. G. Bynum, City Engr., employs the Burkli-Ziegler formula with 1 in. rainfall;

(Continued on page 157)

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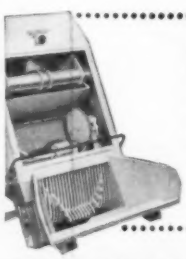

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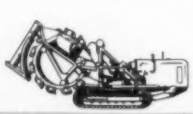

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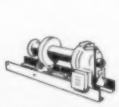

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APWA News

AMERICAN PUBLIC WORKS ASSOCIATION
1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

Three New Committees Organized by APWA Directors

Studies to be Made on Sewer Specifications, Street Sweeping Procedures and Training for Public Works Organizations

Chicago, Illinois—The Board of Directors of the American Public Works Association created three new committees at its regular mid-winter meeting in Chicago on January 27, 1956. These committees have now been organized and are ready to undertake their assignments. The Committee on Training, which was appointed to explore ways and means of assisting governmental jurisdictions to train or otherwise obtain competent persons to fill important positions within their public works organizations, is headed by S. G. Gentile, Administrator (formerly Personnel Director) of the Department of Public Works of Detroit, Michigan. Henry D. Harral, Supervisor of Municipal Assistance, Institute of State and Local Government, University of Penna. at Philadelphia will serve as Secretary of the Committee. Other members appointed to the Committee are: W. E. Parker, City Engineer, Seattle, Washington; H. H. Stirman, Director, Dept. of Public Works, Dallas, Texas; Frederick A. Chworowsky, Director, Bureau of Personnel, Dept. of Public Works, Los Angeles, Calif.; R. S. Hopson, Director of Public Works, Richmond, Virginia; Charles S. Goode, Assistant Director, Dept. of Public Works, San Diego County, Calif.; Robert C. Garnier, Asst. Personnel Director, City Service Commission, Milwaukee, Wisc.; Reed McKinley, Dir. of Public Works, Kansas City, Mo.; and W. C. Wichman, Director, Dept. of Public Works, Cincinnati, Ohio.

Paul R. Screvane, Director of Operations, Dept. of Sanitation, New York City, is Chairman of the newly organized Committee on Street Sanitation which will prepare a revised edition of the Association's book on this subject. M. U. Snoderly, Engineering and Public Works Consultant, Municipal Technical Advisory Service, Univ. of Tennessee at Knoxville is the Secretary of this Committee. The six other members are: H. O. Patton, Supt. of Sanitary Services, Denver, Colo.; George M. Rittner, Director of Sanitation, New Orleans, La.; J. S. Kingdon, Civil Engineer, Street Cleaning Branch, Winnipeg, Canada; J. C. Albers, City Engineer and Supt. of Streets, Glendale, Calif.; James A. Brophy, Street Commissioner, Madison, Wisc.; and John V. Lewis, Director of Maint. and Operations, Dept. of Public Works, Rochester, New York.

The third new committee to be organized is a Sewer Specification Committee. It is headed by H. A. Knudsen, Manager, Sewage Disposal Division of the East Bay Municipal Utilities District in the Oakland Bay Area of Northern California. This committee will prepare a revised edition of the Association's Standard Construction Specification on Sewers. Additional members of this committee are: Newell L. Nussbaumer, Consulting Engineer, Buffalo, New York; Dario Travaini, Supt. of Water and Sewers, Phoenix, Ariz.; E. L. Filby, Consulting Engineer, Kansas City, Mo.; John Craig Oliver, City Engineer, Vancouver, B. C., Canada; Peter Homack, Consulting Engineer, Scotch Plains, N. J.; A. L. Tholin, Chief Sewer Engineer, Dept. of Public Works, Chicago, Ill.; Charles Abramovitz, Consulting Engineer, Dayton, Ohio; and E. F. Hughes, Civil Engineer, Sewer and Water Board, New Orleans, Louisiana.

420 Attend Philly Meeting

Philadelphia, Penna.—A record attendance of over four hundred members and guests were present at the Annual Dinner of the Philadelphia Metropolitan Chapter. The highlight of the program was the presentation of the chapter's annual awards for meritorious service to Edgar P. Grims, Chief of the Electrical Branch of the Department of Public Property and to Alexander Maltman, Chief of the Design Branch of the Department of Water. Donald C. Wagner, Managing Director of the City of Philadelphia made the presentation of the award to Mr. Grim, but Mr. Maltman was unable to attend the dinner because of illness. District Attorney Victor H. Blanc was the Toastmaster for the occasion and the featured speakers were Dr. James Creese, President of Drexel Institute of Technology; James H. J. Tate, President of the Philadelphia City Council, and William S. Foster, Editor of the American City Magazine.

Edgar P. Grims, left, receives service award from Donald C. Wagner, Managing Director of Philadelphia.

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Members Name Candidates for the 1956 Merit Awards

Boise, Idaho—William P. Hughes, Urban Engineer for the Idaho State Highway Department and Chairman of the 1956 Charles Walter Nichols Award Committee recently announced that nominations for this award are now being received. This annual award of $500 will be presented at the Public Works Congress and Equipment Show, to be held in Ft. Worth, Texas, Sept. 23-26, 1956, to a member of the Association for outstanding and meritorious achievement in the broad field of sanitation including street sanitation, water purification and distribution, the collection and disposal of refuse and sewerage. An amendment to the policies and procedures governing this award, adopted at the last meeting of the Board of Directors and approved by the donor, now makes it possible for any Active member, as well as a local chapter, to nominate candidates for this award. The actual selection of the recipient of the award will be made by a committee headed by Mr. Hughes. Others on the committee are George Sandenburgh, City Engineer, Ann Arbor, Michigan, and Warren A. Coolidge, Director of Public Works, Nashville, Tennessee. The selection will be made on the basis of a paper or description of an operation, administration of a function, or design of a facility in the field of activity, which reveals originality of thought and aggressiveness of execution by the candidate. The ideas developed or designed must have been put to practical use within the governmental unit in which the candidate is employed. Who's your candidate? Simply write a letter, giving the name and address of the member you wish to nominate and a brief statement of his accomplishment, and send it to the American Public Works Association, 1313 East 60th Street, Chicago 37, Illinois. If he is qualified for the award by being a full-time employee of a municipality, he will then be advised of his nomination and requested to furnish additional information for the Committee's consideration.

In Service Training Discussed at Michigan Chapter Meeting

Detroit, Mich.—The last monthly meeting of the Michigan Chapter featured a panel discussion on "In Service Training". Louis H. Moehr, City Engineer, Wyandotte pointed out that the time and effort put into such programs would pay big dividends through increased production and efficiency. De Witt Maguire, Training Coordinator for the City of Detroit, spoke on the requirements for effective training, and Robert Carter of the Dow Chemical Company showed slides and briefly described the various types of training programs that have been developed and used in private industry. C. A. Johnson, Secretary-Treasurer of the Chapter announced that plans are now being made for an all-day meeting to be held in Midland on May seventeenth.

Association Conducts Survey of Refuse Handling Practices

Chicago, Illinois.—Several months ago a special committee was appointed by the President of the American Public Works Association to prepare a revised edition of their book on *Refuse Collection Practice*, which was first published in 1941 and is widely used throughout the United States. Warren A. Schneider, Director of the Los Angeles Bureau of Sanitation is Chairman of this Committee which is composed of some of the nation's foremost authorities in the field. The text of this new book

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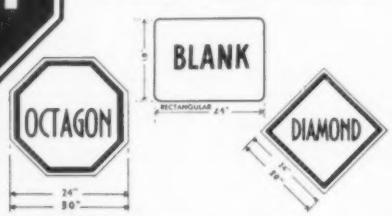

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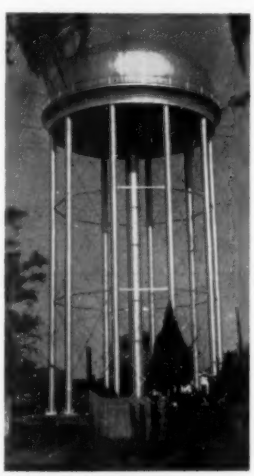

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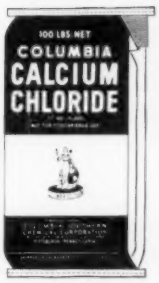

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will be based, in part, upon detailed information which is now being collected from questionnaires which were recently mailed to officials in over 2,000 municipalities of over 5,000 population. The questionnaires were addressed to the City Manager of the cities which have such an official and to the City Clerk or comparable official in all other cities. The persons receiving the questionnaire were requested to refer it to the person most directly concerned with this subject. A resume of the results of the survey will be sent to all officials who return the completed questionnaires. A detailed analysis and evaluation of the information received will be included in the new edition of the Association's book on this subject which is expected to be ready for publication by the middle of next year.

Iowa Chapter Meets in Ames

Ames, Iowa—The Seventh Annual Iowa Public Works Conference was recently held at the Iowa State College in Ames. It was presented by the Civil Engineering Dept. of the College and the Iowa Chapter of the APWA. Carl Fagerlind, Street Comr. of Waterloo and President of the Chapter spoke about the accomplishments of the Association at a luncheon on the opening day of the conference. Thomas H. Nelson, City Attorney of Dubuque was the guest speaker at the dinner meeting which was presided over by Professor L. O. Stewart, Head of the College's Civil Engineering Department. Among the topics discussed were: "Keeping the Public Informed" by Robert L. Price, City Manager, Ottumwa; "Providing Off-Street and On-Street Parking" by Adrian Koert, Traffic Engineer for the consulting engineering firm of George W. Barton & Associates, Chicago, Illinois; "Construction and Maintenance of Asphalt Pavements" by W. L. Hinderman, District Engineer, The Asphalt Institute, St. Paul, Minn.; and "Paving Assessments" by Clifford Hamblin, Director of Public Works, Mason City. Others participating on the program were: J. F. Downie Smith, Dean of Engineering, I. S. C.; Melvin Manion, Director of Public Works, Ames; Quentin Wildman, City Engineer, Boone; Raymond Forsberg, Director of Recreation, Waterloo; L. K. Sieck, Civil Engineering Instructor, I. S. C.; Allen Wind, City Engineer, Clear Lake; John L. White, Asst. City Engineer, Dubuque; Walter A. Voss, Jr., Asst. City Manager, Des Moines; Henry Beisner, Director of Public Works, Cedar Falls; and Harris F. Seidel, Supt., Water and Sewage, Ames. The next meeting of the chapter is scheduled to be held in Ottumwa in October.

Removal of Existing Sidewalk and Curb

On a job involving the removal and replacement of 120,000 lineal feet of curb plus several thousand feet of asphalt sidewalk, the R. E. Hazard Contracting Company of San Diego, California, was able to triple production with the use of a multi-purpose Gradall.

The method used on this job was to first remove the asphalt sidewalk and then to cut out behind the curb, grasp the curb section inside the Gradall bucket, break it free and load it onto a truck. The Gradall removed 2800 feet of sidewalk and 2800 feet of curb a day. Before the Gradall was used on this job, previous methods of operation handled only from 800 to a thousand feet a day, and at least two separate specialized pieces of equipment had been needed for the job. The Gradall not only increased production but also was able to remove the curb without breaking the asphalt pavement between curbs.

• SIDEWALK slabs were peeled up quickly and cleanly with the Gradall.

• CURB sections are broken loose by the bucket, then loaded in truck.

Mulrain Named to INTAPUC Committee

Newark, N. J.—Edward P. Decher, Secretary and Purchasing Agent of the Joint Sewer Commission of Newark and President of the APWA, recently announced the appointment of Andrew W. Mulrain, Commissioner, Dept. of Sanitation, New York City, as the Association's representative on the Executive Committee of the International Association of Public Cleansing. Commissioner Mulrain replaces Robert B. Brooks, Consulting Engineer of St. Louis, Missouri who had served on the committee for a number of years. Mr. N. G. Wilson, Engineer and Manager of the Lighting and Cleansing Dept. of Edinburgh, Scotland is the current president of this International Organization.

Western Conference Set For April 15-17

Oakland, Calif.—John A. Morin, City Engineer of Oakland and President of the Northern California Chapter of the American Public Works Association is General Chairman of the Local Committee which is completing plans for the 1956 Western Public Works Conference to be held at the Leamington Hotel in Oakland—April 15, 16 and 17. The Conference has been scheduled at the request of many public works officials in the eleven western states. A meeting of the State Chairman of that area will also be held in conjunction with this Conference which is sponsored by the APWA in cooperation with the League of California Cities and the Institute of Transportation and Traffic Engineering of the University of California. The tentative program includes panel discussions on a variety of subjects including: "Functions of Public Works Under Disaster Conditions" with special emphasis on the actual evacuation of areas during disasters and the problems of financing and reconstruction; "The Professional Manpower Problem" with particular attention being given to the utilization, recruitment and retention of personnel and the use of newly developed labor-saving devices and procedures; and "The Construction of Public Works" which will feature talks by construction

personnel, including those connected with utility installations. Other topics will also be discussed and an interesting program is being arranged for the ladies together with the usual get-togethers and banquets which are famous in the West.

• • •

Refuse Collection and Disposal Data

In a recent questionnaire sent by PUBLIC WORKS Magazine to city engineers and superintendents of Public Works the question was asked: Do you collect refuse by city forces? Or by contract? The question was answered by 689 of these returning the first group of about 850 questionnaires. The answers showed that 446 cities collected by city forces and 243 by contract—nearly two to one for municipal collection.

Another question asked was: What method of disposal do you use? Of the 682 replies, 333 reported sanitary or land fill; 98 reported incineration; 200 used dumps; and 51 used "other" methods.

• • •

Washington News

(*Continued from page 32*)

flect intangible benefits or costs, such a ratio should not be the only criterion of desirability of a particular project. It recommended that the evaluation period to be used in estimating benefits and costs be limited to 50 years, tempered in the case of irrigation projects, by an additional 10-year payment-free period for development to take place.

"The Committee also recommended that investigation of major projects be undertaken only when approved by Congress, and that major Federal projects be authorized only by specific act of Congress.

"On the subject of participation in costs, the Committee stated that it was unable to discover for all cases a completely equitable, yet practicable, procedure for cost sharing, based solely on the principle of sharing costs in proportion to benefits. It proposed, however, that as a general policy, the Federal Government should not build any project or part thereof that can, under fair and reasonable terms be built by non-Federal interests, except those projects of primary national concern, where non-Federal interests are unable adequately to meet the need. Otherwise indentifiable beneficiaries of Federal proj-

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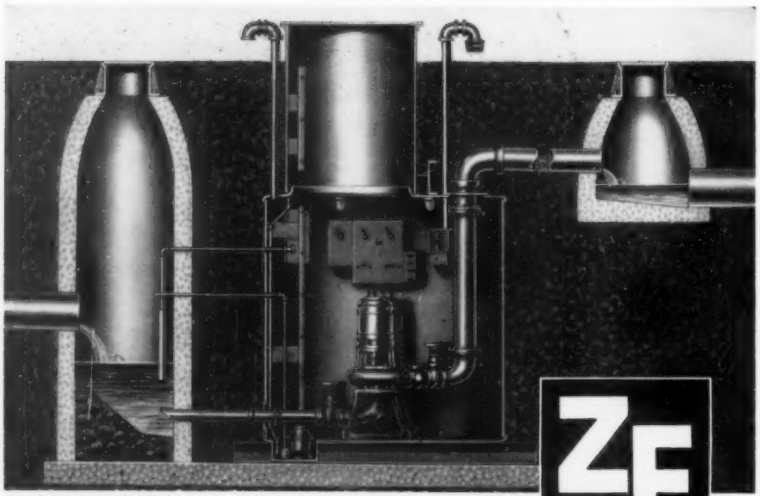

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ects should pay an appropriate share of costs in all instances. Beneficiaries of power, municipal, and industrial water supply should pay 100 percent of costs allocated to these purposes. The use of excess revenues from power and other purposes to help meet irrigation costs is endorsed, provided such revenues are applied in the area in which they are derived. Responsibility for maintenance, operation and management of projects should be turned over to non-Federal interests as soon as feasible in consideration of the Federal investment."

Federal Highway Act of 1956 Takes Shape

The House Ways and Means Committee recently approved a measure to levy nearly 14 billion dollars of new taxes on highway users over the next 16 years to finance a stepped up road building program. In a last minute action, the committee included a requirement for an annual registration fee of $1.50 per 1,000 pounds for all trucks weighing over 26,000 pounds. Other tax increases proposed by the committee apply uniformly to all vehicles regardless of size or weight. They call for a one cent increase in the present two cents per gallon gasoline and diesel fuel tax; a three cent per pound increase in the present five cent tire tax; a two percent increase in the tax on the sales price of trucks, buses and trailers; and a new tax of three cents per pound on camelback (retread rubber).

This financing plan is expected to be offered as an amendment to the revised Fallon Bill (HR.8836) when it reaches the floor of the House. Authorizations under the Fallon Bill, for the federal-aid primary, secondary and urban systems are increased slightly from the $700 million authorized by the Federal-Aid Highway Act of 1954. However, major increases are authorized under this bill for the interstate system. It provides that the "sums . . . authorized shall be apportioned in the ratio which the estimated cost of completing the National System [of Interstate and Defense Highways] in each State bears to the estimated total cost of completing the National System in all of the States as set forth in the computations compiled by the Bureau of Public Roads on pages 6 and 7 of the House Document Numbered 120, Eighty-fourth Congress . . ." Ten percent of the cost

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would be borne by the State and ninety percent by the Federal government under the original wording of HR. 8836.

The bill authorizes the Secretary of Commerce upon the request of a state to acquire, in the name of the United States any lands or interests in lands (including the control of access to lands from adjacent lands) required by such state for right-of-way or other purposes in connection with any project for construction, reconstruction or improvement of the interstate system. Full title to all such lands may be conveyed to a state whenever it is able and agrees to control access. Such sums shall be included in the federal apportionment to a state wherein they are expended. Another provision of the bill states that "Whenever a State shall pay for the cost of relocation of utility facilities necessitated by the construction of a project on the Federal-aid primary or secondary systems or on the National System [of Interstate and Defense Highways], including extensions thereof within urban areas, Federal funds may be used to reimburse the State for such cost in the same proportion as Federal funds are expended on the project."

HR 8836, which is now being considered by the House Public Works Committee, also includes a section that provides that a state may receive credit for an existing toll or free highway located upon the interstate system and meeting the standards of the system. Another interesting feature of the bill is a provision establishing an emergency fund of $30 million for repair and reconstruction of highways damaged or destroyed by natural disasters. Annual appropriations to replenish the fund is provided. No expenditures could be made from the fund less an emergency had been declared by the Governor and concurred in by the Secretary of Commerce. The Federal share of any repair or reconstruction project cost could not exceed 50 percent.

Administration's Housing Bill

The Administration's housing legislative proposals took shape and form in bills, known as the Housing Amendments of 1956, which have been introduced in both Houses of Congress. On February 27th, Congressman Widnall introduced HR 9537, and on the following day, S 3302 was introduced (by request) in the Senate by Senator Capehart and Senator Sparkman.

The proposed bills follow the blueprint of housing legislative proposals which President Eisenhower had given in his State of the Union and Budget Messages in early January.

Changes with respect to *Urban renewal* are largely technical to avoid overlapping and duplication, or to make certain requirements in existing law consistent with others. Several amendments would enable urban renewal agencies to be more useful in major disaster areas by freeing disaster areas from meeting certain usual requirements such as workable program, conformance to general plan of the locality, public hearings, etc. Also for disaster purposes, FHA's urban renewal mortgage insurance aids could be used without regard to workable program requirements, and urban planning assistance under Section 701 could be provided for a community without regard to the less than 25,000 population limitation.

The proposed legislation would increase the urban planning grant authorization from $5 million to $10 million.

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Preparation for Natural Disasters and Civil Emergencies

NECESSITY TO prepare for natural disasters has been repeatedly demonstrated during the past year. The current need and desire for civil defense can and should be coupled with a program of preparation for disaster relief. The principal elements in each are the same —advance planning, organization of personnel and equipment and a reasonable degree of training. Planning for natural disasters can help in civil defense because it supplies the touch of realism that is so often lacking in civil defense with its rapidly changing background and shifting policies.

Natural disasters and civil emergencies may include the following, but is not limited to them. Local conditions in many areas introduce added factors which should be detected and analyzed in preparation for sound planning.

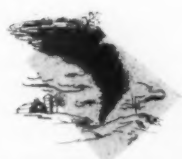
1. **Floods** are an annual occurrence in some areas, occasionally likely in others and remote or entirely absent in many communities. Effects of floods may be restricted to certain limited sections, or may be widespread. Generally, occurrence is in areas that may reasonably be determined in advance and therefore specific plans are usually possible. There is likely to be a warning period—in some cases short; in others of several days.

2. **Earthquakes** generally occur only in specific areas which can be well defined by geologists, but they are not predictable. Therefore, there can be no warning, but general plans can be made for rescue and relief in case an earthquake occurs.

FIRE

TORNADO

EXPLOSION



HURRICANE

FLOOD

3. **Fires** are not predictable but the areas of greatest hazard and potential danger to the community can be closely determined in advance. Plans for fighting fires is a function of the Fire Department, but the Disaster Organization can help in advance planning to mitigate loss and suffering.

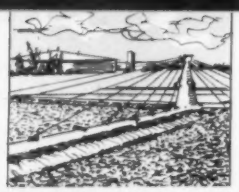
Explosions may be grouped with fires, and they often cause or may be caused by fires. Again the areas of maximum hazard can be determined approximately in advance.

4. **Hurricanes** are generally predictable several days in advance with present weather services. In areas of well-built houses, the greatest dangers are from high tides and flooding along coastal areas, damage to electric power lines with accompanying loss of light and heat and sometimes of cooking facilities and water. Floods often accompany hurricanes, as was the case in 1954 and 1955 in the East.

5. **Tornados** are more likely to occur in some areas than others; some sections are practically free from the tornado threat. There is warning in some cases; in others practically none. Damages to homes and power lines is often severe.

6. **Snowstorms** differ from those listed above in that small actual property damage occurs, aside from that to automobiles, and the emergency is less pressing except for the relief of snowbound travelers. **Ice storms** may be considered a variation of this problem, but are per-

(*Continued on page* 192)



PUBLIC WORKS DIGESTS

THE SEWERAGE AND REFUSE DIGEST

Municipal Bonding For Treatment Facilities

The authors have studied data on financing sewage treatment works as published during the period of 1951-1954 and found that bond yields are about 1 percent less for large municipalities than for small ones. The yield for revenue bonds is generally a little over one-half percent higher than for general obligation bonds, and the average term for revenue bonds is generally about five years greater than for general obligation bonds. Bond yields are generally lower in the northeastern areas of the United States and generally higher in the southeastern area. Of the total bond value issued, 50 percent yield less than 3.0 percent for revenue bonds and less than 2.4 percent for general obligation bonds. Long term bonds in general have yields about 1½ percent higher than short term bonds.

"Municipal Bonding for Sewage Treatment Facilities." By John H. Ludwig, B. J. Steigerwald and G. E. McCallum, U. S. Public Health Service. *Sewage and Industrial Wastes*, December.

Membrane Filter's Advantages and Disadvantages

Some have given as a disadvantage of membrane filtration that large samples must be used, too large to be practicable for field sampling and refrigeration. But samples as small as those used for MPN analyses will give as accurate results. It is an advantage that by MF, greater precision is obtainable by using larger samples than are practicable in MPN procedure. Another objection advanced is that the cost of materials for an MF test is greater than that of media required for an MPN determination; but this is offset by the saving in labor and glassware. As to the significance of the MF tests, it is still a moot question whether the same organisms are counted in the two tests; the authors think it probable that the MF is selective for *E. coli*, which would be a point in its favor. Meantime it can be said that the simplicity, ease, convenience, precision, and speed with which the MF test is completed, and meaningful bacteriological levels obtained, have been clearly demonstrated in field and laboratory through almost four years of routine testing by the Los Angeles County Sanitation Districts.

"The Membrane Filter: Advantages and Disadvantages." By A. M. Rawn, Chief Eng., and F. R. Bowerman, Div. Eng., Los Angeles San. Districts. *Water and Sewage Works*, January.

Fly Emergence From Sanitary Fill

One of the most important reasons for burying garbage and mixed refuse is to control flies. Garbage usually, when collected, contains large numbers of fly larvae. Also flies will lay more eggs in it if it is accessible to them. Adequate cover will prevent the latter, and prevent emergence of flies from buried larvae. To learn what cover will be adequate, the Bureau of Vector Control, California Dept. of Public Health, has investigated this and reached the conclusion that, using a light sandy loam as cover, a 60-inch depth, if uncompacted, does not deter the emergence of house flies; but if the soil is compacted at 8.5 percent moisture content, 1⅛ in. was effective. Within the range of 6.5 to 12.5 percent moisture, emergence was prevented with a compacted cover of 1⅝ to 2¼ in. Under field conditions, 3 to 6 in. should be sufficient.

"Earth Cover for Sanitary Landfills—The Effect of Housefly Emergence." By Ralph J. Black and Allan M. Barnes, Bureau of Vector Control. PUBLIC WORKS, March.

Oolite-Covered Sanitary Fill

Key West, Florida, collects about 1400 cu. yd. of refuse daily and disposes of it by sanitary fill. Cover fill is obtained by dredging from the Gulf a oolite, often referred to as marl. It is a soft rock, easily pulverized, can be worked like clay and becomes hard and dense when compacted. This is spread about a foot deep on the fill. Rats cannot burrow into it nor insects breed in it, nor can odors rise through it.

"An Oolite-Covered Sanitary Fill." *American City*, February.

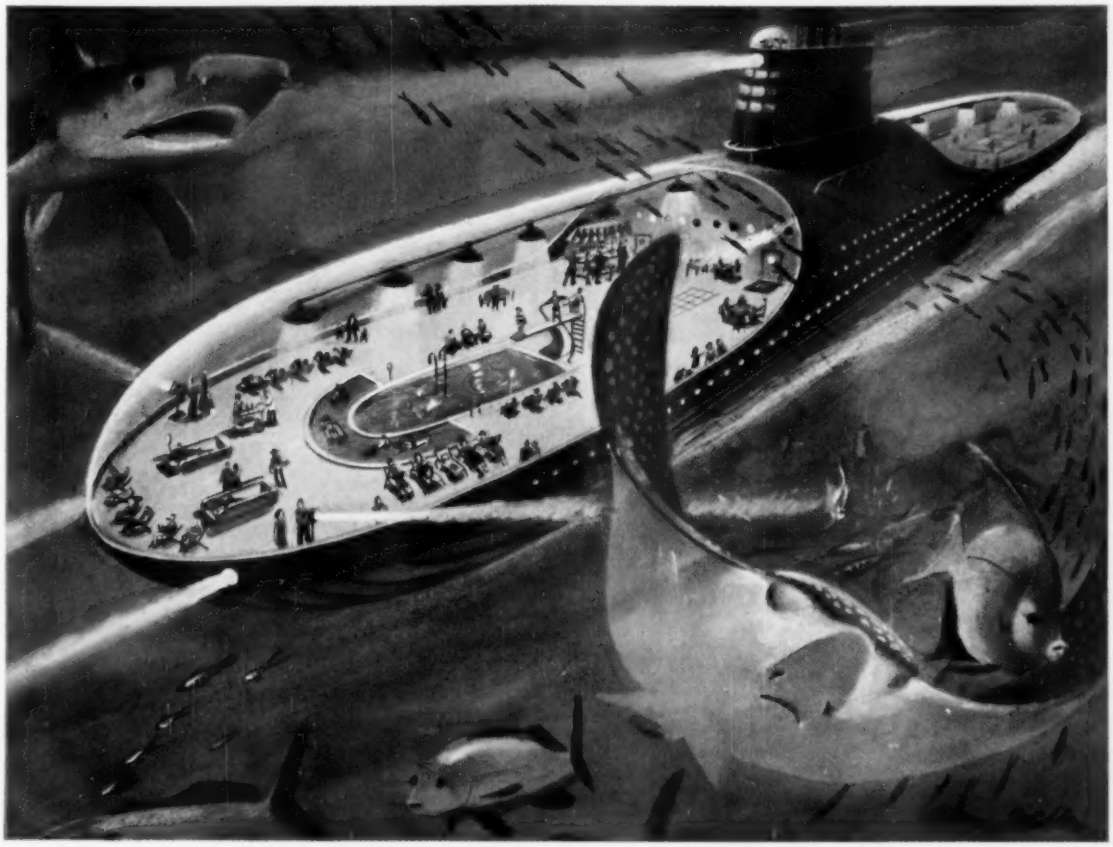
Effects of Detergents in Sewage Works

Studies of the effects of synthetic detergents at several English treatment plants led the authors to conclude that the most serious effect is due to the slowness of their decomposition in the plant, wherefore some detergent always passes through to the diluting stream. The maximum ill effect occurs during winter, when the crude sewage is strongest and the treatment plants are at their minimum efficiency.

"'Tide' and 'Santomerse' in the Sewage Works." By R. D. Raybould and L. H. Thompson. *The Surveyor*, Jan. 14.

High-Rate Sludge Digestion

Successful operation of high-rate sewage sludge digestion units at maximum loading appears to depend on continuous mixing and feeding a sludge as concentrated as possible and as nearly continuously as possible. The first is absolutely essential. A study of this problem was made by operating a series of laboratory digestion units at detention times of 6, 8, 10, 15 and 20 days. They were fed twice daily and the contents mixed continuously by recirculation of gas. Volatile solids loadings ranged from 0.26 to 0.38 lb. per cu. ft per day. Volatile matter destruction varied from 52.2 percent in the 6-day digester to 58.2 percent in the 20-day digester; grease destruction was 53.0 percent and 71.4 percent respectively. Gas yield decreased in proportion to the volatile matter destroyed, practically all in the methane. The gas yield per pound of volatile matter destroyed seemed to have no definite relationship to detention time. Protein degradation in the 6-day digester was apparently 86 percent of that in the 20-day. The nitrogen and



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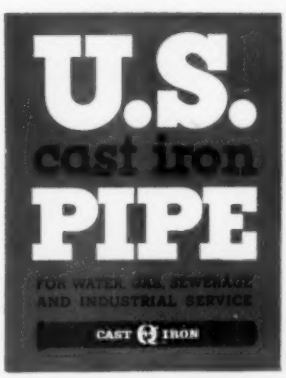

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phosphorus content of all digested sludges was quite uniform, except in that from the 6-day unit, where it was noticeably lower. The grease content of the digested sludge increased significantly as the digester time decreased, ranging from 6.65 percent in sludge from the 20-day digester to 9.50 percent in sludge from the 6-day unit.

In view of information which exists at the present time, it appears that high-rate digestion units can be operated safely using a 10-day detention period without significant sacrifice of gas production or degradation of sludge quality. By feeding an 8 percent sludge the total and volatile solids loadings will be approximately 7 times the conventional rate of feed.

"A Laboratory Evaluation of High-Rate Sludge Digestion." By C. N. Sawyer and H. Kay Roy, Prof. and Research Asst., M.I.T. *Sewage and Industrial Wastes*, December.

Recirculation of Oxidation Pond Effluent

Oceanside, Calif., in 1950 constructed a 12-in. sewage outfall extending 2,000 ft. into the ocean. When the population doubled, the flow exceeded the capacity of the outfall, and in 1954 the city constructed a 5-acre oxidation pond for receiving the excess effluent from the primary treatment plant during peak flow periods. The pond effluent was supersaturated with D.O. and was recirculated at rates varying from 12 to 14 percent of the raw sewage flow. This decreased the chlorine consumption and reduced odors.

"A Double-Duty Oxidation Pond." By Edward O. Sampson, Chief Operator. *Sewage and Industrial Wastes*, December.

Dual Operation at the Peoria Activated Sludge Plant

After 40 years of study of the activated sludge process, the mechanisms and chemistry involved are not fully understood. This paper discussed recent studies of problems at the Peoria, Ill., activated sludge plant, and indicates the direction in which the data observed seem to point. Dual aeration as practiced at this plant has the following characteristics: Ability to control the SVI and maintain the index at a low value; to treat industrial wastes in shock loads, with the activated sludge regaining its clarifying properties immediately after shock loads have been received. It is able to maintain high suspended solids concentration in the aeration tanks to produce higher concentrations of suspended solids in waste activated sludge, primary settling tank sludge and waste digested sludge; and to maintain a high degree of stability in the activated sludge, thus simplifying plant operation.

The data indicate that dual aeration, diffused air in combination with properly applied distributed air, is an efficient means of aeration. Combined with sludge index control in a nitrifying aeration tank, it results in ability to treat effectively high BOD loadings; to use low aeration periods, thus reducing power costs. Need for filtering air is eliminated. Low submergence results in a saving of power required for the air supply. The turbulence produced increases the oxygen absorption from diffused air and also from the liquid surface.

"Dual Aeration as a Rugged Activated Sludge Process." By L. S. Kraus, Chemist. *Sewage and Industrial Wastes*, December.

Securing Maximum Efficiency From Trickling Filters

The author makes the following recommendations for operating high-rate filters: For strong sewage, use a two-stage plant, with sufficient recirculation to keep the effluent BOD down to a proper level. Return only

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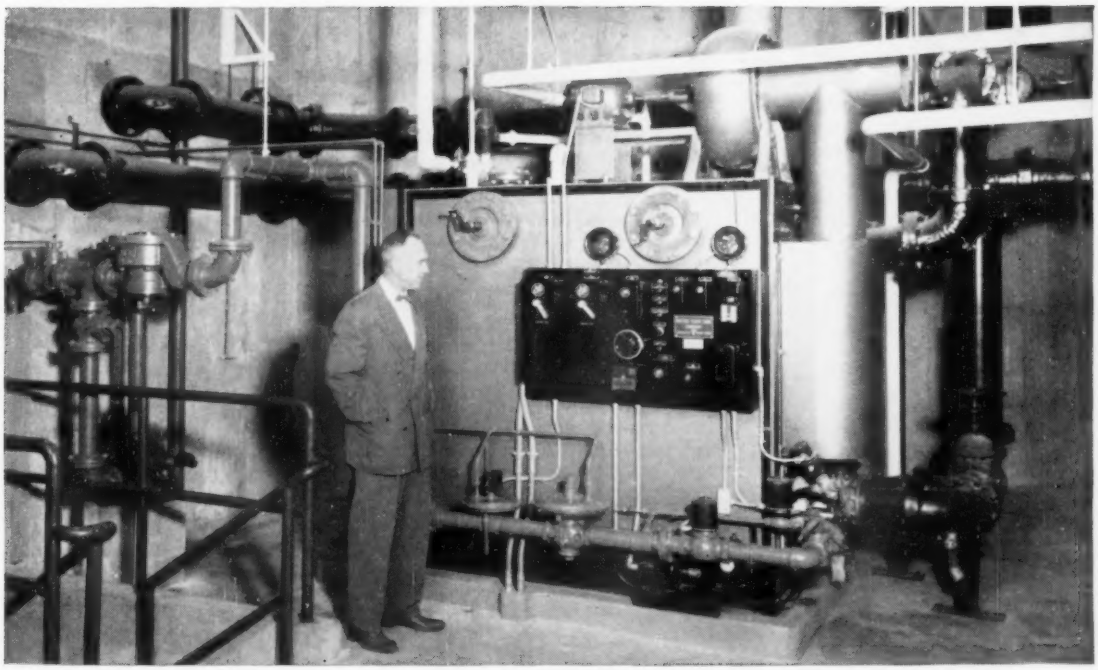

Green Bay selects PFT Digester Heater for operating economy, close control

In expanding its digesting operation, Green Bay, Wisconsin once again chose PFT equipment for modern *controlled* digestion. In 1936, PFT had supplied the primary treatment plant with two Floating Covers for its 40' digesters.

Key feature of the newly expanded plant is the PFT Heater & Heat Exchanger (750,000 B.t.u. per hr.). Located in the adjacent Control Chamber with all parts accessible, this compact unit heats sludge *externally* with no piping or equipment required inside the digesters.

PFT Spirally Guided Gas Holder installed in Green Bay's new 85' digester. Unit has a gas storage of 28,000 cu. ft.; can be held under operating pressure of 6" of water col.

Temperature of the sludge is maintained at optimum range by recirculating raw sludge or digestion tank contents (or a mixture of both) through the unit.

By heating sludge *outside* the digester, the unit eliminates many maintenance problems. Unlike the system in which coils are located in the digestion tank, the PFT Heater can be cleaned without interrupting the digester operation. All parts of the unit are readily accessible—return bends and sludge tubes are held in place by gasketed joints so that cleaning and adjustments require less time and effort.

The PFT Heater provides operational economy by utilizing all sludge gas produced in the digester. Fired by gas *or* oil, the unit is switched to oil only when the gas supply is low, thereby cutting digester fuel costs substantially.

Additional PFT equipment recently installed at Green Bay includes a *Spirally Guided Gas Holder* (see illustration) and a complete Gas Safety System for maximum protection against fires and explosions.

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good digester supernatant to the plant. Pump sludge from the primary settling tank frequently—hourly both day and night if possible. Do not use much small rock in the filter bed. Secure good distribution on the filter, good ventilation and proper maintenance. Avoid many shutdowns. Prevent excessive amounts of mineral oil from reaching the filter, and skim off any that may reach the final clarifier.

"Trickling Filter Design Loadings." By J. A. Montgomery, Lakeside Eng. Corp. PUBLIC WORKS, March.

Other Articles

"Care and Operation of **Imhoff Tanks.**" By Leroy W. Van Kleeck. **Wastes Engineering,** February.

"Improving **Activated Sludge** Treatment at Davyhulme," Manchester, England. Public Works, March.

"Detergent Research Related to Water and Sewage Treatment" by soap producers questions any serious effect. By F. J. Coughlin, of Procter & Gamble Co. Public Works, March.

"The **Manchester Report** and the Derby Sewage Treatment Studies." Comparison of results obtained by three types of activated sludge plants. By John Finch, Mgr. of Sewage Disp., Slough, England. Water & Sewage Works, February. (An abstract of this appeared in "The Sewerage and Refuse Digest" for February.)

"Metal Finishing Wastes and Sewage Treatment." General discussion by English engineers. Contractors Record, Feb. 1.

"Effect of **Metal Finishing Wastes** on Sewage Purification." By A. E. J. Pettet. The Surveyor, Feb. 4.

"The **Alternating Double Filtration** Process of Sewage Treatment." Need of reliable operating data to prove its efficiency. The Surveyor, Jan. 28.

"Sewage and Industrial Wastes in 1955." **Annual review** by Rolf Eliassen and Ross E. McKinney, Profs. of San. Eng., M.I.T. Water & Sewage Works, February.

"Primary Sedimentation." Part 5 of "Sewage Works Practices." By Don E. Bloodgood, Prof. of San. Eng., Purdue Univ. Water & Sewage Works, February.

"Two-Stage Trickling Filters Prove Best" at Watertown, Wis. American City, February.

"New Separator Improves Milorganite Production." Description of 8 months' experience. By Joseph A. Maiers, Div. Eng., Milwaukee Sew. Comm. American City, February.

"Design of Sewage Treatment Plant for a **Farm Colony.**" By L. S. Shields, Jr. Public Works, March.

"Recent Advances in **Sludge Digestion.**" By Theodore Jaffe, Assoc. Prof. of Civ. Eng., Univ. of Florida, Water & Sewage Works, January.

"Alkyl Benzene Sulphonate **Detergents.**" Investigations in England on their influence on sewage purification. By R. D. Raybould and L. H. Thompson. Contractors Record, Jan. 18 and 25. Municipal Engineering, Jan. 13.

"Solving **Difficult Pumping** Problems at a Sewage Treatment Plant" of the Los Angeles County San. Dist. by use of a new type of pump, the "Wemco." By Norman W. Anderson, Supervising Civ. Eng. Public Works, March.

"Survival of Coliform Organisms in Pacific Ocean Coastal Waters." By Isadore Nusbaum, San Diego Water Pollution Control B'd, and Richard M. Garver, U. S. Naval Hospital. Sewage and Industrial Wastes, December.

"Safety Is Keynote for **Double Chlorination** at Sacramento" for odor control and disinfection. By Richard Kennedy. Wastes Engineering, February.

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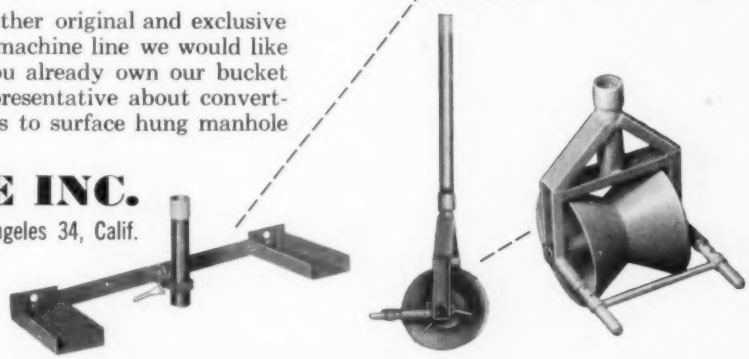

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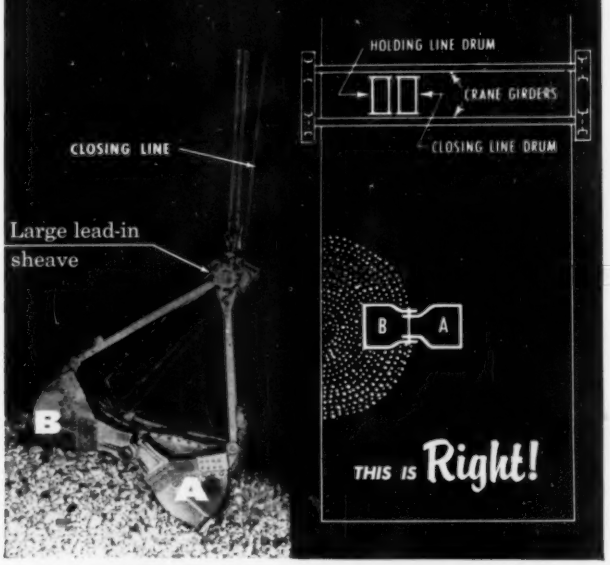

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RIGHT-OF-WAY PRACTICES in Minnesota

E. S. WARD,

Kandiyohi County Engineer,

Willmar, Minnesota

THE method of procuring right of way for highway purposes in Minnesota counties is quite varied. There are 87 counties in the state and no two follow identical procedures. From the earliest times up to and including the present, nearly all roads established by petition or legal procedure in Minnesota have been established with 4-rod or 66-foot rights-of-way. This procedure has been so standard that most publishing houses sold road petition forms with the 4-rod width printed in.

In the early days of the state, many roads came into being, not by petition but by use. Someone drove through the country, probably cutting some obstructing brush and the limbs of trees so they could get through. When washouts occurred or spots became impassable, the local government, either county or township, started maintenance, so the trail became an established road by user, and to the full extent of the user. Later laws were passed by our legislature making the right of way of all roads by user, 4 rods or 66 feet in width.

It is quite general practice now for Minnesota counties to acquire rights of way up to 100 feet in width on their new construction. Quite frequently they use 100 feet on their main county trunk roads and 90 feet on the less heavily travelled roads. This leaves the county with the problem of increasing their right of way width by 24 or 34 feet.

Frequently delegations appear before the county board requesting the improvement of a certain section of road in which they are particularly interested. Generally the abutting property owners accompany this delegation and right-of-way questions are settled easily at that time. The county board often says "If you will furnish the required right of way we will furnish the improvement". It is surprising how often this works out to the benefit of everyone.

In many localities the property owners are sufficiently interested in having their road improved so that they will, without cost to the county, sign highway or slope easements with permission to place pole lines and fences 45 or 50 feet from the center line of the highway. The county pays for the removal and reconstruction of the fences, replaces black dirt on the slopes and seeds the right of way to a suitable grass crop which the farmers will cut for hay.

The County Board has the right, where the general course of the road is not materially altered, to acquire right of way by purchase, by gift or by condemnation. This statute is used for minor changes in alignment.

The statute establishing a county road by petition provides that the right-of-way shall be at least 4 rods or 66 feet in width and our State Attorney General has held that it may be any reasonable width in excess of 66 feet, such as 100 feet, and that the additional width may be taken by petition; that is, where a road has been established by petition with a 4-rod right of way. Where there is no desire to change the location of the center line, the County Attorney or Engineer rather than attempting to negotiate with each individual property owner, can make up a new petition for the establishment over the same route of a right of way to the width desired or required. This petition must be signed by 24 free-holders of the county. An examination is made of the amount and type of property affected with a recommendation to the county board as to the amount of the damages to be awarded. The owner is also compensated for the moving of any buildings or fences that are affected by the taking of this additional width. The County Board acts on the petition and sets the amount of damages. Any property owner not satisfied with the award may appeal to the courts.

Minnesota counties are authorized to condemn lands for additional width or for changes in alignment. These proceedings take place in district court and are handled by the County Attorney. The County Highway Engineer makes up a plat or right of way map showing the location, width and length of the proposed right-of-way and indicates the owners of the land to be condemned. The court appoints three viewers to appraise the property and recommend the amount of the award for damages. The county has the right of entry as soon as the proceedings are instituted. On state trunk highways the state condemns nearly all of its right of way and the cost is substantial. The County on its heavier traffic roads has more problems and pays more than on its less heavily traveled roads.

This is part of the paper presented by Mr. Ward at the National Highway Conference of County Engineers and officials, Gatlinburg, Tenn.

No Ground or Surface Water Problem

A drainage system of Armco Hel-Cor pipe is being installed around a swimming pool built for the Park Department of Kansas City, Mo. The spiral - corrugated perforated pipe does two jobs here—perforations intercept ground water all around the pool, and the risers remove surface water and water splashed out of the pool by bathers.

• • •

A Uniform Law to Combat Highway Litter is Urged

A national organization of state government officials has urged governors and other officials of each state to adopt a uniform law to combat litter along highways and other public areas. The Council called attention to "an almost complete lack of uniformity" in present anti-litter laws. Cited as examples of variances

in litter status were definitions of litter itself, areas where trash dumping is banned, who should enforce litter laws and the penalty inflicted on violators. The council's drafting committee has forwarded to state bill-drafting units suggested legislation, including seven major points to guide states in revising or augmenting their litter prevention laws.

The recommended statute calls for an all-inclusive definition of litter. Many states currently prohibit tossing of only specific items, among them being tin cans, nails and bottles. Only California and Indiana charge all local and state police with enforcing litter laws. The Council of State Governments believes all states should adopt this policy.

It suggested limiting the state laws to include litter deposited on public property, such as right-of-way limits on a highway, and on parks, beaches and other public facilities. The driver of a motor vehicle would be responsible for litter thrown from his car when there is doubt concerning which occupant committed the violation.

Fines ranging from $10 to $100 were recommended by the state officials. Present penalties for littering range from a minimum of $1 in Kentucky to $1,000 in Georgia.

• • •

Reflector Signs Show Day and Night Speeds

When new state traffic laws went into effect recently in Michigan putting a 65-mile speed limit on daylight driving and 55 after dark, new signs were posted along the roadway. These read "65" in the daylight but when illuminated by automobile headlights the sign automatically changes to read "55."

• • •

Storm Drainage Design Practices for Cities

(*Continued from page* 139)

Shafter, J. W. Harris, Supt. of Public Works, designs for 1 in. rainfall. The rational method is used by Visalia.

Colorado: The Burkli-Ziegler formula is used by Aurora, E. P. Sandquist, City Mgr.; Colorado Springs, James Murray, Supt. of Public Works, designs by the Talbot formula and a 2-in rainfall; Longmont, J. J. Baranway, City Engr., designs for 1.75 in/hr., and Montrose, A. E. Kujala, City Engr., for 1 in. with the rational method.

Connecticut: Bloomfield, P. C. King, Town Mgr., designs for 10-year storm; Hartford, W. W. DeMay, Ass't.

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City Engr., uses the rational method; so does Stratford, R. E. Blake, Dir. of Public Works, basing design on the 20-year storm; Wethersfield, C. F. Langry, Town Engr., designs for a 2 in/hr. storm.

Delaware: Milford, S. C. Marvel, City Mgr., uses 2 ins. per hour for design.

Florida: Belle Glade, C. E. Robinson, City Mgr., designs for 1 in.; so does Hollywood, G. A. Gieseke, City Engr.; Fort Lauderdale, E. Patterson, City Engr., uses 2 ins.; and Melbourne, T. Huguely, City Mgr., and Sarasota, Max Sturm, City Engr., use 3 ins. Mr. Sturm reports that he uses Q = ACI, with c = 0.6 and I = 3.0; Winter Park, J. Hilliard, City Engr., designs for a 5-in. rainfall.

Georgia: Augusta, W. R. Barnes, Supv. of Public Works, uses 2-in. rainfall for design; Thomasville, L. B. Craig, City Mgr., uses 4 ins.

Idaho: Boise, J. L. Morris, City Engr., designs by a modified McMath formula, with i = 1 in/hr.

Illinois: Deerfield, J. D. Hooper, Village Engr., uses the Burkli-Ziegler formula with rainfall at 2.75 in/hr.; Oak Lawn, R. D. Moyers, Resident Engr., designs for 2 ins., and Riverside, A. L. Sandberg, Ass't. City Engr., for 1½ ins. The City Engineer of Wheaton reports using 5 ins. for design.

Indiana: Crawfordsville, L. B. Clore, City Engr., employs the rational method with 2-in. rainfall; Kokomo, L. A. Warden, City Engr., designs for 2.75 ins/hr.

Iowa: A 1-in. rate is used by Algona, L. K. Ferguson, City Engr., while Cedar Falls, H. F. Beisner, Dir. of Public Works, designs for 2-in. rainfall and Fort Dodge, J. E. Wright, City Engr., uses 4-ins.; Marion, C. G. Gabelman, Sr., City Engr., designs on a 3-in. basis and Mason City, C. E. Hamblin, Supt. of Public Works, at 2.55 in./hr., with the Burkli-Ziegler formula; Sioux City, Ivan R. Bray, Dir. of Personnel, designs for 3 ins. and Storm Lake, I. L. Samuelson, City Engr., for 2 ins. an hour.

Kansas: The rational method with 2-in. rainfall is used by Emporia, R. Cunningham, City Engr. Design in Garden City, Karl J. Svaty, City Engr., is by the Burkli-Ziegler formula and a 2-in. rainfall per hr. Other design rates are: Great Bend, H. H. Callon, City Engr., ¾ in.; Lawrence, E. J. Allison, City Engr., 2 ins.; Manhattan, D. C. Wesche, City Engr., 1.375 ins.; Russell, N. A. Ericson, City Engr., 2.5 ins.; Salina, Leland Srack, City Mgr., 1.5 ins.; and Wichita, G. J. Fisher, Dir. of Service, 2 ins.

Louisiana: Melaine, Jefferson Parish, Roersle & Gallaway, Consulting Engrs., employ the rational method and the New Orleans modified curve for rainfall.

Maine: Design in Bangor is by the Burkli-Ziegler formula and 2-in. rainfall; Lewiston, Geo. Mahar, Dir. of Public Works, also uses a 2-in. rainfall for design; Portland, B. O. Whitney, Dir. of Public Works, employs the rational method and design for a 10-year storm.

Maryland: In Frederick, W. R. Walter, City Engr., design is by the rational method for a 10-year storm. In Salisbury, P. C. Cooper, City Engr., provision is made for a 3-in. rain with 15 percent runoff.

Massachusetts: Design for storm drainage is based on a rainfall rate of 1 in. per hour in Marblehead, R. O. Burlingham, Town Engr.

Michigan: Clawson, R. O. Wright, City Mgr.; Detroit; Huntington Woods, E. H. Waterhouse, City Mgr.; Jackson, William D. Monroe, City Engr.; Oak Park, Richard L. Castle, City Engr.; and South Haven, Max L. Norris, Supt. of Public Works, all base design on a 10-year storm. South Haven stating this is a 4-in. per hour rain; Lansing, C. E. Thornton, City Engr., uses the rational

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method; Marshall, Victor D. Camp, City Engr., designs by the formula $15/\sqrt{t}$, with rainfall ranging from 3.25 to 3.88 ins. per hr.; Pontiac, Lewis M. Wrenn, City Engr., uses the rational method and a 2-in. rainfall; Port Huron, A. T. Carlisle, City Engr., employs the rational method and determines probable rainfall by the formula 120/15 + t. Springfield, Willard Norris, City Mgr., designs for a rain of 1 in/hr.

Minnesota: In Cloquet, B. R. Boyer, City Engr., utilizes the rational method and a rainfall of 0.6 in. in 10 minutes; Fairmount, W. J. Youngerman, City Engr., designs by the rational method for 5 or 10-year storms. Rainfall in Fergus Falls, F. E. Heuson, City Engr., is estimated for design by the formula 90/(t + 13); Hutchinson, James A. Lindsay, City Engr., uses a 3-in. rainfall for design, while Mankato, E. G. Hill, City Engr., designs for a 3½-in. rainfall, using the rational method; Minneapolis, Hugo G. Erickson, City Engr., also employs the rational method and designs on the basis of a 10-year storm of 2.11 ins. per hr.; Montgomery, Jos. T. Rynda, Jr., City Engr., uses 1 in. per hour for design. In Owatonna, R. R. Fleming, City Engr., employs the Burkli-Ziegler formula with a rainfall rate of 2.75 ins./hr.; Willmar, E. B. Enns, City Engr., designs on the basis of 2 ins./hr.

Mississippi: Greenville, J. H. Tuenisson, Jr., City Engr., uses a 2-in. rainfall.

Missouri: Both Marceline, Rodney Cantwell, City Engr., and Springfield, Raymert Miller, Ass't. City Engr., report using a design rate of 4 ins. per hour; Springfield designs by the Burkli-Ziegler formula.

Montana: In Laurel, John Dennis, City Engr., bases design on a 1-in. rainfall.

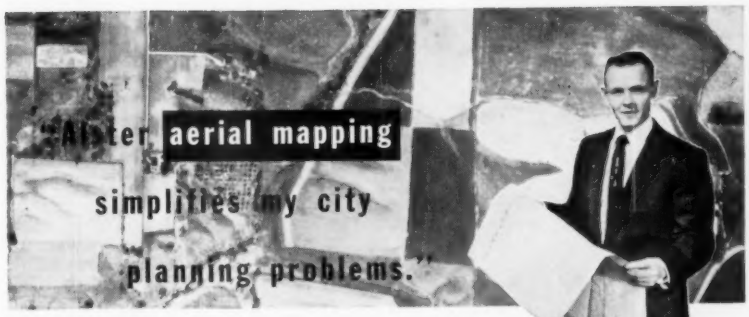
Nebraska: Hastings, Harold Williams, City Engr., uses a 5-year rainfall frequency of 4 ins./hr. for design.

Nevada: In Sparks, C. J. Dodson, City Engr., employs the rational method and a 1 in. per hour maximum rainfall.

New Hampshire: A 2-in. rainfall is used for design in Claremont, Gordon Dillon, City Mgr.

New Jersey: In Metuchen, W. F. Buchanan, Borough Engr., designs for a rainfall of 1.75 ins./hr., using the Burkli-Ziegler formula. The rational method is used in New Market, C. J. Kupper, Twp. Engr., with a 3½-in. rainfall; Somerville, E. S. Van Fleet, Borough Engr., also designs for a 3½-in. rain.

New York: The rational method, with 4-in. rainfall, is used in the



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Bronx, Herman Ginsberg, Engr. of Design, while Brooklyn, C. A. Riedel, Chief Engr., determines probable rainfall by the formula $150/(t + 20)$. In Kingston, E. A. Steuding, Supt., Public Works, designs by the rational method for a 3-in. per hr. storm. Massapequa Park, uses 2½ ins. New Rochelle, A. F. Jonas, Supt., Public Works, designs for a 5-in. 25-year storm. Syracuse, Potter W. Kelly, City Engr., employs the rational design method and a 2-in. rainfall per hour.

North Dakota: Both Bismarck, E. J. Booth, City Engr., and Williston, Herbert Arnold, City Engr., design for a rainfall of 1½ ins. per hr. Minot, R. B. Riddle, City Mgr., uses a 1-in. rate for design.

Ohio: Ashtabula, F. A. Collins, City Engr., employs the rational method with a rainfall rate of 2.75 ins./hr. Cincinnati, T. J. Montgomery, City Engr., also uses the rational method but computes probable rainfall for designs by the formula $170/(t + 23)$. A 5 and 10-year storm frequency, with the rational method is employed in Elyria, R. E. Kleinoeder, City Engr. The rational method is also used in Orrville, P. V. Breneman, City Engr., with a 2-in. rainfall for a 10-yr. storm. In Toledo, J. H. Davis, Com'r. of Engrg. & Constr., computes probable storm intensity for design by the formula $12/\sqrt{t}$. University Heights, H. Peterson, City Engr., designs by the rational formula for a rainfall of 1-in. per hour, while Xenia, G. D. Ackerman, Service Director, bases design on a 3-in. rainfall rate per hour.

Oklahoma: In Bethany, H. B. Macrory, City Mgr., design is for a 3-in. rate of rainfall, but in Norman, Jack Kalman, City Engr., a 4-in. rate is used.

Oregon: Wide variations are evident in Oregon, which is explained in part, at least, by the difference in the 15-in. annual rainfall in The Dalles and the corresponding 96-in. rainfall in Tillamook. Corvallis, V. L. Goodnight, uses ½ in. per hour; so does Grant's Pass, R. B. Laursen, City Engr. Springfield, E. L. Williams Acting City Engr., designs for a 4-in. per hr. rainfall. In Roseburg, Kenneth Meng, City Engr., allows for a flow of 0.2 cfs per acre.

Pennsylvania: A. N. Wiegner, City Engr. of Bethlehem employs the rational method, with 3 in./hr. for maximum rainfall rate, while Bradford, J. H. Quirk, City Engr., uses a 2½-in. rate. In Middletown, Evan Norton, Mgr. of Public Works, designs for a 4-in. per hr. rate; H. B. Gulden, Boro. Mgr., Pottstown, bases design on a 3.2-in. rate. C. W. Miller, Springdale Boro. and Twp. Engr., uses the McMath formula with a rainfall rate of 3.8 ins.

South Carolina: Florence, D. C. Barbot, City Mgr., designs on the basis of 2 ins. per hr.

Tennessee: In Knoxville, J. E. Ashe, Field Engr., reports the rational method is employed with a maximum 6-in. rainfall.

Texas: Stanton Field, City Engr., Amarillo, reports using the Burkli-Ziegler formula, with a 4-in. rainfall in 4 hrs. Bay City, Johnie Zapalac, City Engr., uses a 4-in. rainfall rate, and Bellaire, L. M. Rice, Dir. of Public Works, reports a 3-in. design rate. In Cleburne, F. J. Carol, City Engr., uses the Q=AIR formula with 2.25-in. per hr. rain. Drahn Jones, Dir. of Public Works, Corpus Christi, designs for a 5-yr. storm; Fort Worth, C. M. Thelin, Dir., Public Works follows the rational method, using a 3-in. per hr. rainfall rate. In Hereford, D. S. Jones, City Engr., designs for a 5-min. rainfall at the rate of 4.53 ins. per hour, using the rational method. Odessa, T. G. Morris, Dir. of Public Works, designs for a 5-yr. storm; Sherman, Jeryl D. Hart, City Engr., designs for the Texas Highway Dept. 2-yr. frequency storm. In Weslaco, the Burkli-Ziegler formula is used with a 1-in./hr. rainfall.

Virginia: Alexandria, I. F. Willard, City Mgr., designs by the rational method for 3 in./hr. rainfall. Norfolk, S. C. Morrisette, Dir. of Public Works, also uses a 3-in. rainfall.

Washington: Jack Sleavin, City Engr., Aberdeen, reports design is based on a 2-in. rate of rainfall. Everett, R. V. Colvin, City Engr., uses Q=CIA, with a 1-in. rate of rainfall.

Wisconsin: Q=ciA, with i=2 ins. is used in Beaver Dam, R. N. Baker, Ass't. City Engr. Beloit, R. D. Connell, City Engr., uses 3 ins. per hr.; Cudahy uses 3½ ins.; and Eau Claire, D. D. Rowlands, City Mgr., 3 ins. Robert J. Poss, City Engr., Marinette, designs by the rational method with a rainfall rate of 2.5 ins./hr., and notes that a very large storm drain program is under consideration. M. J. Noth, City Engr., Menasha, uses the rational method and a 1.5-in/hr. rate. Shorewood, R. D. Sullivan, Com'r. of Public Works, reports using Q=AIR, with intensity of 3.5 ins./hr. Viroqua, Leon Chase, City Engr., designs for a 2-yr. storm. In West Allis, R. E. Hahn, Ass't. Supt., Public Works, employs the rational method and a 4-in./hr. storm. West Bend, M. W. Schaefer, City Engr., designs for a 10-yr. storm. J. M. Katzban, Village Engr., Whitefish Bay, uses 3.05 ins. per hr. for design.

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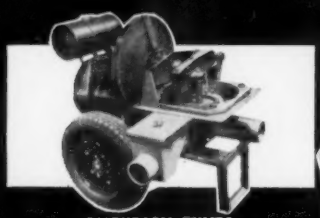

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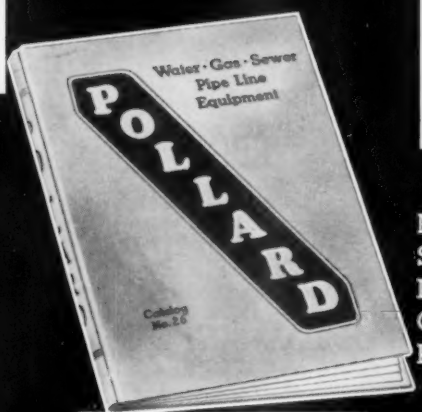

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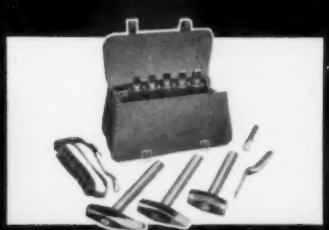

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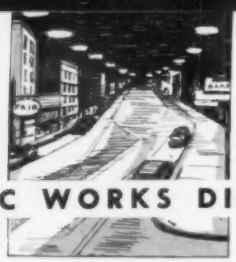

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Mechanical Seeding And Fertilizing in Virginia

Virginia Dept. of Highways is enthusiastic about mechanical seeding, fertilizing and mulching of right-of-way on both new construction and maintenance work. It has constructed six hydraulic seed sprayers in its own shops and has recently purchased two commercially built "Hydroseeders." On one job it was calculated that use of this method resulted in a saving of 60 percent in cost. On new construction work, 500 to 1000 gal. of water are mixed with fertilizer and 40 to 80 lb. of seed, which suffices for one acre. A second application is made the following year, using about 50 percent of the original amount. The seeding operation is preceded by mulching, using straw and emulsified asphalt, from 40 to 200 gal. of the latter to a ton of mulch, jet sprayed.

"Virginia Experience with Mechanical Seeding, Fertilizing, and Mulching, *Roads and Streets*, January.

Elaborate Hillside Drainage

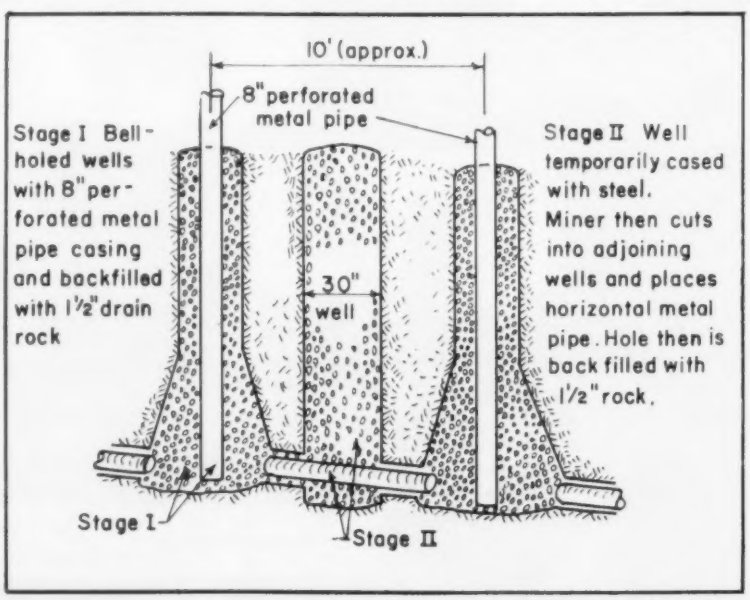
Mountain Boulevard, in Oakland, Calif., skirts a hillside built up with fine homes which developed serious slides, and stabilizing this was considered necessary. To effect this, an elaborate system of underground drains 30 to 40 ft. below the surface was constructed parallel to about 700 ft. of the highway. Wells 30 in. in diameter were drilled to a depth below the adjacent roadway level and belled at the bottom to a diameter of about 6 ft. by a man lowered into the hole. Then an 8 in. perforated iron pipe was set vertically in the hole and the space around it backfilled with granular material. Between these holes other 30-in. wells were drilled to the same depth as access shafts, and men working at the bottoms of these shafts installed 8-in. perforated pipe horizontally to connect the bottoms of the several drain wells, thus forming a continuous drainage line interconnecting all the wells. These access shafts were then filled with rock. About 120 wells were placed in two rows about 10 ft. apart, and the water collected from the wells was led to a drain placed along the side of the freeway by means of a hydrauger. The system is expected to drain by gravity, but to test it and hasten lowering the groundwater level, two pumps with suction lines lowered into the vertical pipes in the wells were installed temporarily. Immediately after these pumps began operating, the groundwater level dropped to 15 to 30 ft. below the top of the cut.

"Connected Wells Installed to Stabilize California Hillside." *Roads and Streets*, January

Administration of Engineering Forces on a Toll Road

Consulting engineers charged with the design of a toll road must possess many different skills, each representing a distinct branch of engineering. This article touches upon all operations, both of design and construction of 12 miles of the Ohio Turnpike.

Each Contracting Engineer was faced with important and difficult administrative questions. The contract was signed in the morning and by that afternoon men were on their way to the field to begin the preliminary work. Additional men had to be hired, office space obtained, a communication system set-up and special provisions for the cost accounting on the project was necessary. Integrating and reconciling the specifications desires of the Consulting Engineer, the Turnpike Commission and the Department of Highways on one hand with the desires and restrictions of County and City governments on the other presented the Contracting Engineers with problems of engineering diplomacy. Work stoppages were created by winter weather and legal complications, ways had to be worked out to keep the men busy.


10' (approx.)
8" perforated metal pipe
Stage I Bell-holed wells with 8" perforated metal pipe casing and backfilled with 1½" drain rock
30" well
Stage II Well temporarily cased with steel. Miner then cuts into adjoining wells and places horizontal metal pipe. Hole then is back filled with 1½" rock.
Stage I
Stage II

Courtesy Roads and Streets

Construction of drainage and access wells installed to stabilize a hillside area.

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The contractors created problems by not reading the specifications and not making soil and topographic investigations before bidding. However, when a serious problem arose everyone worked together as a team to have the Ohio Turnpike open on time.

"Engineering Administration For a Toll Road" By A. E. Stilson, Consulting Engineer. PUBLIC WORKS, March.

Research in Asphaltic Road Materials

Existing standard asphalt specifications do not contain requirements that are indicative of quality. Tests suitable for use as specification requirements are needed. The most important quality of a road asphalt is the ability to resist destructive effects of heat during construction and other weathering agencies in service. Heat susceptibility of asphalts as presently measured may not be directly related to the susceptibility of the finished pavement. The standard ductility test is also questioned as a quality index, but still has its virtues. Ductility and heat susceptibility suggested as subjects for future research.

The Bureau of Public Roads has consistently refused to embody in its specifications identification tests which bear no relation to the quality obtainable with various asphalts. The status of extraction tests and tests for hardening and anti-stripping, is discussed in detail by the author. The most important current research is on resistance to hardening and on anti-stripping. New progress is in sight as a result of cooperative action by highway material engineers and refinery technologists.

"Current and Needed Research in Asphaltic Road Materials." By E. F. Kelley, Chief, Physical Research Branch, B.P.R. *Roads and Streets*, January.

Using Highway Engineers Most Effectively

County engineers were asked how they made the best possible use of their engineers by simplifying plans and other preliminary procedures for secondary road work. Some say that plans for work performed by the department's own forces and equipment are kept as simple as possible, simpler than if made for contract work. One county reports that force-account work requires only a traverse of the proposed location with land tie-ins, a center line profile, and a good foreman. For contract work, it saves time in the long run to prepare a fool-proof set of plans; simplified plans often lead to misunderstandings that take considerable time to straighten out. Eleven county officials offer suggestions based on their experiences.

"Simplifying Work of Making Plans." *Better Roads*, February.

Attracting Engineers To Highway Work

Salary alone is not enough to attract personnel. The work should test the skill, imagination and knowledge of the engineer. Career opportunities, protection against arbitrary dismissal, and in-service training leading to advancement opportunities are necessary. There should be training programs designed to further the engineer's knowledge and fit him into the organization as quickly as possible; adequate pay based on duties and responsibilities with periodic pay raises guaranteed if job performance is satisfactory; liberal sick

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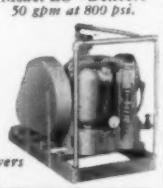

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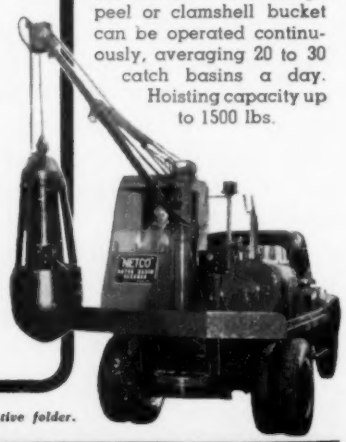

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"Increasing Production of Highway Engineers." By Harold L. Plummer, Wisconsin State Highway Com'n. *Better Roads*, February.

Traffic Control By Automation

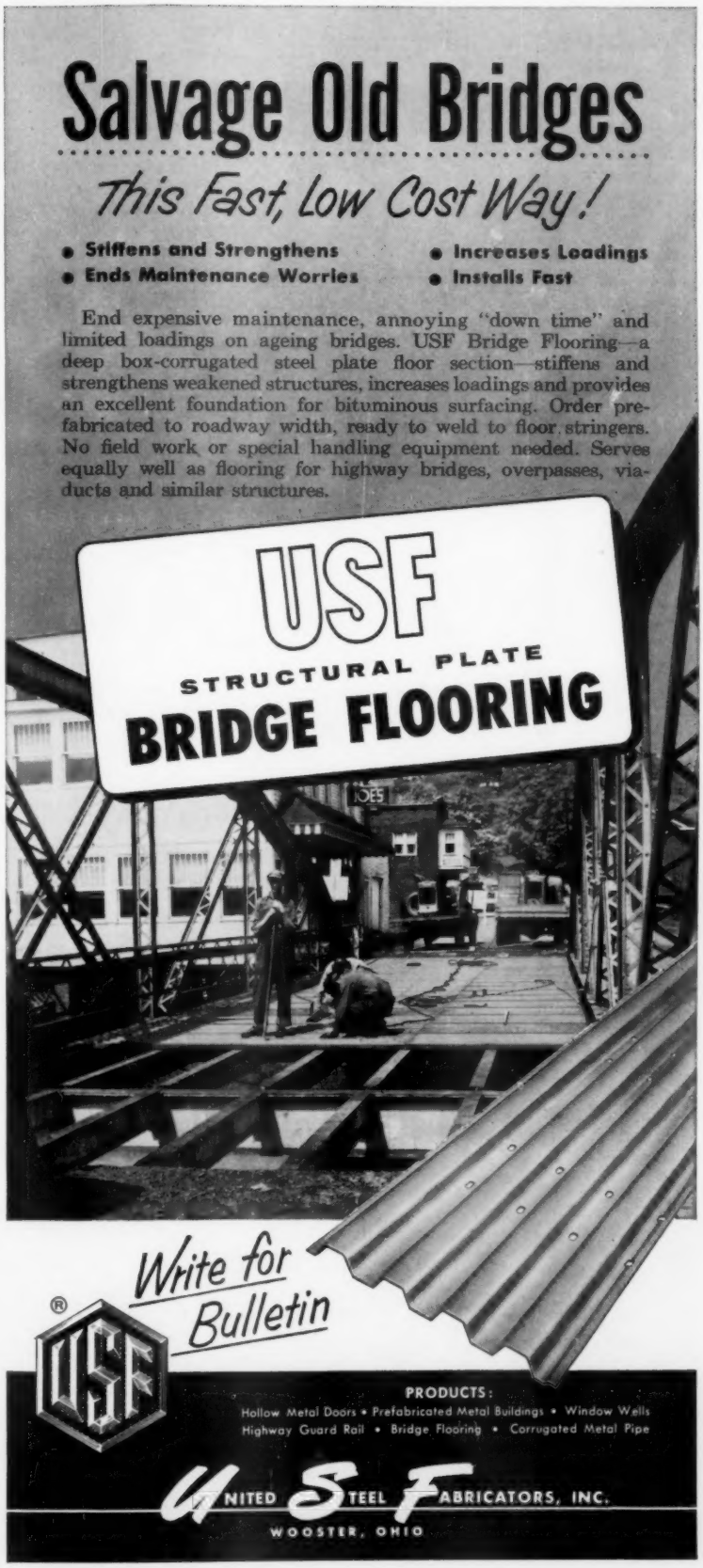
A traffic control tower, operated by one man has recently taken the place of five traffic policemen in regulating a flow of 40,000 cars a day at five intersections near the Miami International Airport, Dade County, Florida. The control board was designed by Lowell Powers, traffic engineer in the Durval County Engineering Department.

The control board consists of a curved panel, with five series of red, green and amber lights. Each series designates an intersection. The officer on duty scans the intersection, anticipates possible traffic jams and presses the right button on the board to clear a possible jam before it starts. The traffic officer can control each intersection singly or collectively. He leaves a green light on long enough to clear a heavy traffic load moving in one direction. If there is mechanical trouble, a change from panel operation to a single operation can be made in a second.

"Traffic Control by Automation." PUBLIC WORKS, March.

Slide Stabilization By Means of Horizontal Drains

The Bureau of Public Roads of Colorado has been using drilled horizontal drains to stabilize slides. A 6-in. hole is drilled under a wet and sloppy area and 1½ in. or 2 in. perforated water pipe or tubing is inserted, usually by hand; but if the hole is crooked or has caved in, the drain pipe is inserted through the core drill head, in the same manner as a drill rod, using hydraulic pressure and rotation to force it into the hole. The equipment used for this work includes a core drill with N-2 hydraulic swivel head; drill rods in 5 and 10 ft. lengths; both cone-type rock bits and finger or drag bits; a high-pressure mud pump; and a small bulldozer to build trails to drilling sites and dig sumps for drilling water. They find that very little increase in the stability of a slope often will obviate slides; that when ground water can be located the drilled horizontal drain method has proved most successful in slide stabilization. Costs are determined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largely by nature of material and accessibility of site.

"Slide Stabilization with Drilled Horizontal Drains." By William L. Eager, Maint. Eng. *Roads and Streets*, February.

Force Account on County Road Jobs

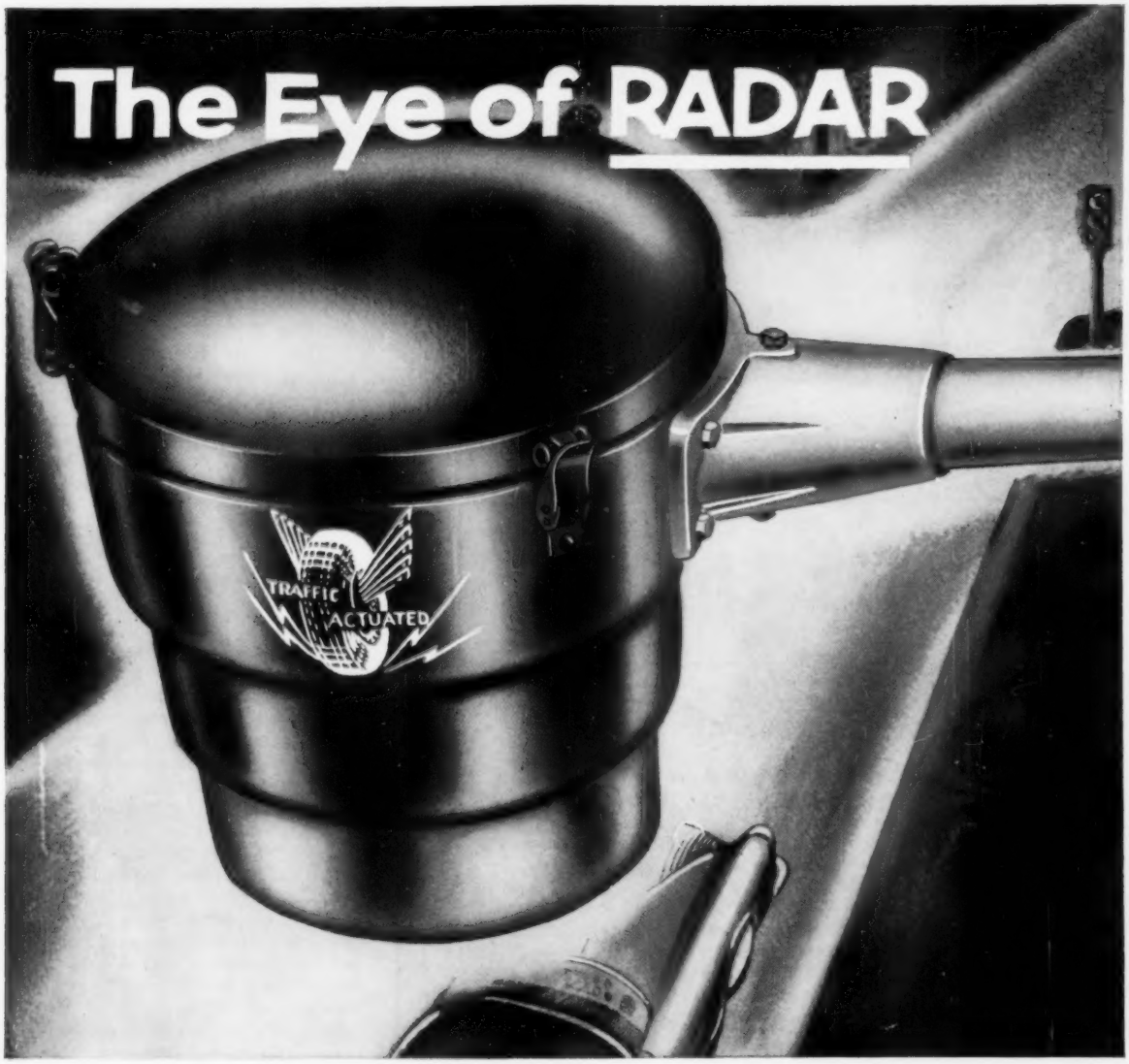
The road budget for Douglas County, Washington is $500,000 yearly and the county is faced with a tough construction problem by having a shallow clay soil over solid bedrock. Some projects do not lend themselves to contract work readily, being more feasible to do on a force account basis. Where counties have available equipment, force account work can be accomplished cheaper and these projects can be limited to $25,000 total, including engineering. A typical force account job was a 23,000 cubic yard fill project. Using D7 Caterpillar Tractors, 11-yard struck capacity Le Tourneau Carryalls, Half-Yard truck shovel, Michigan truck mounted shovel units and five-yard dump trucks this job was accomplished. Precipitous rock ledges created a drilling problem and a three-wheeled Ingersoll wagon chuck, using a 30-lb. hammer, steel and carbide tipped bits, operating from a Schramm compressor solved this problem.

Another typical job was the widening of a four mile section of a road that was built on a 26-foot subgrade within a 40-foot right-of-way. A Pettibone-Mulliken 1¾-yd. loader working perpendicular to the ditch was able to get the steepest slope as close to the right-of-way line as possible. Many short dead-end, and mismatched streets 600 to 800 feet long forced the use of each piece of equipment separately on each street bituminous paving project. A grader, 10-ton and 8-ton rollers and a tailgate chip spreader are the equipment used on this type of project.

"Where Force Account Works Best on County Road Jobs." By Pat Thomson, Douglas County Engineer. PUBLIC WORKS, March.

Testing of Asphalt Additives

A good additive should be effective on both acidic and alkaline aggregates; be completely miscible with the asphalt; have good heat stability; and have little or no effect on asphalt inspection tests. The important problem of predicting field performance from bench-scale laboratory tests has been al-



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most entirely overlooked. The author describes two new tests that promise to provide a more realistic appraisal of performance than does customary laboratory procedure. These are a mechanical mixing test, based on mixing aggregate and asphalt under conditions similar to those used in actual practice, which correlates well with observed field performance; and a mechanical sieving test, based on the principle that particles of well coated aggregate adhere to each other and do not pass through a coarse sieve.

"Use and Testing of Asphalt Coating Additives." By L. T. Crews and M. L. Kalinowski, of Standard Oil Co. of Ind. *Roads and Streets,* February.

Concrete Paving In Europe

The author gives, in this paper, information about present practices in Germany, Denmark, Belgium and Holland in the construction of concrete pavements, obtained by personal visits to those countries. The information is practical and quite complete. Some of the more interesting items are given here, greatly condensed. In Germany, greater attention is given to appearance as seen by the road user, sketches, photographs and models being used for planning the use of curves, buildings, trees, etc., for this purpose. In some cases artificial lakes are constructed at sites provided for restaurants. The slab thickness of concrete pavements in all the countries ranges between 8 in. and 9½ in. for main roads, regardless of traffic, of local conditions, or of whether reinforcing is used. Germany has considerable mileage of both reinforced and unreinforced roads laid before and during the war, and with the knowledge of how these have stood up, all main roads now being laid in Germany are reinforced; but no other countries use reinforcement. The amount of steel used has generally been 2 to 4 lb. per sq. yd., but the tendency is to use more, even 16½ lb. in some experimental roads. Up to the present, the general practice as to joints has been to make slabs 100 to 110 ft. between expansion joints, with two dummy joints, but now slabs are made 120 to 140 ft. long, with sawed contraction joints 20 to 25 ft. apart. In Holland, expansion joints are being placed up to 250 ft. apart. In the countries named, mixes are made quite rich, and up to 40 percent sand is used. Waterproof paper is almost invariably used on the

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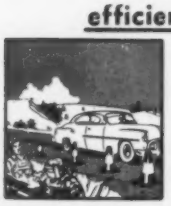

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subgrade. There is a general tendency to lay the slab in two layers, thoroughly compacting the bottom one as well as the top.

"Continental Concrete Roads." By D. R. Sharp. *Contractors Record*, Jan. 25.

Maintenance Of Expressways

The density and high speed of traffic on expressways intensify the necessity of reducing the time that men and equipment occupy the roadway during maintenance operations. This is aided by the maximum possible use of machinery, and keeping it in first class condition. The maintenance staff should include mechanics, electricians, and others needed to maintain the construction equipment, toll collection booths, sewage and water supply plumbing, lighting, radio equipment, and roadside planting. Construction should include hard-surface shoulders flanked by grass berms and flat side slopes. Drains should provide a maximum velocity of 3 ft. per second. On the New Jersey Turnpike to provide safety to men and traffic, line-painting trucks are followed by two others just behind, the rear one carrying a large caution sign and red flashing blinkers. Such trucks also follow the grass cutting equipment. When patching of the roadway is necessary, only one lane is worked at a time and warning signs are placed a mile before the work and traffic cones at 75-ft. intervals from here to the location of the work to keep traffic from this lane.

"Maintenance on Expressways." By Charles M. Noble, Chief Eng., N. J. Turnpike Authority, PUBLIC WORKS, March.

Other Articles

"Considerations Affecting the Design and Construction of **Stabilized Road Bases.**" By D. J. Maclean, British Road Research Lab. Contractors Record, Dec. 28.

"Shortcuts to Quicker Lower Cost **Compaction**" by use of rubber-tired tractors and sheepsfoot rollers. Roads and Streets, January.

"**Perforated Concrete Subdrains** Installed to Correct Pumping of Runway Pavement" at Richmond, Va. Roads and Streets, January.

"**Rebuilding Dirt Roads** in Delaware" for $18,400 a Mile. By John B. Carson, Constr. Eng. Better Roads, February.

"Builds First **Prestressed Concrete Bridge**" in Cook Co., Ill. Better Roads, February.

"**Spring Maintenance** That Lasts All Summer," using small patrol during optimum blading season. By Pat Thomson, County Eng. Public Works, March.

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In-Service Training Program for State Road Department

T. L. BRANSFORD,

Engineer of Research and In-Service Training,

Florida State Road Department

AN IN-SERVICE Training Program to develop its young engineers very rapidly to qualify for positions of greater responsibilities was established in June, 1953, by the Florida State Road Department. The incentive for the program was a poll of the Civil Engineering Students at the University of Florida in which the majority gave a training program first priority among the items they considered most important in selecting their first position after graduation.

In the beginning it was thought that the program should not only serve as an orientation program for the newly graduated college students but should also provide an opportunity for those employees who could not go to college, but who had several years of practical experience in the State Road Department to compete with the college graduates. This thinking still holds true and has proven an incentive for the non-college trained employee to study on his own and compete in the same program with the college graduates.

To accomplish this dual purpose an entrance examination was designed to select trainees from the non-college trained employees. This examination is in two parts, four hours of a general intelligence test in science and mathematics and a psychological test; and four hours of general questions on highway engineering. The intelligence test is designed for the high school graduate and the highway engineering questions are those you would expect a first class instrumentman or engineer inspector to be able to answer. The college graduates are accepted on the recommendation of their professors without an entrance examination.

The program began as a joint project with the Civil Engineering Department of the University of Florida. The writer, at that time an Associate Professor of Civil Engineering with the University of Florida, made out and graded all examinations and visited all trainees and their supervisors in the field for counseling. All clerical work and assignment of trainees was handled by an employee of the State Road Department. As of July 1, 1955, these two responsibilities have been combined and assigned to the Engineer of Research and In-Service Training with offices in Gainesville, Florida.

All training is accomplished by varying the assignments of the trainees. He is a regular working employee and must do all studying necessary on his own time. No formal classes are held. Individual attention is given the trainee by his supervisor on the job, however, and any questions he may have are thoroughly explained.

There are seven different phases in the program as follows: Phase I, Administration, 3 months; Phase II, Highway Location, 3 months; Phase III, Highway Design, 6 months; Phase IV, Bridge Design, 3 months; Phase V, Highway & Bridge Construction, 6 months; Phase VI, Materials Testing, 3 months; and Phase VII, Highway Maintenance, 6 months, giving a total of 30 months.

Trainees are assigned to all seven phases but not necessarily in their numerical order. The order is largely dependent on the work load of the department and to a certain extent on the wishes of the individual trainee.

The assignments of the trainees are varied within each phase. For example in Phase V—Construction, a trainee will be assigned to the Surveying party, to inspections on several types of construction and to office computations and reports.

Each supervisor submits a monthly report on the trainees assigned to him. These reports show the type and quality of work he is doing, his general attitude toward his work and a rating of his capabilities for the duties assigned to him.

When each phase is completed a written 8-hour examination is given covering that particular phase. A minimum grade of 70 must be earned or the trainee is required to repeat the phase. A failure in any two phases eliminates the trainee from any further participation in the program.

If the monthly reports are satisfactory and the final examination is passed a $10 per month increase in salary is given for a 3-month phase and $20 per month for a 6-month phase. Thus the salary is progressively increased from $350 per month at the beginning of the program to $450 per month when it is completed.

The competitive entrance examination is given once each year and thirty trainees enter the program each year. The difference between the number of college graduates who accept employment each year and thirty is the number of regular employees who are chosen. They are chosen strictly on the rank they attain on the competitive entrance examination.

Of the trainees who have entered the program, 42 have been college graduates in Civil Engineering; 52 have had varying amounts of college training in Civil Engineering or other fields or have studied engineering by correspondence; six have had no formal education beyond high school but have had practical experience with the State Road Department.

Two have failed a final examination on one phase. Four resigned to accept other employment, one in engineering, two in contracting and one outside the roadbuilding field. Ten were promoted to engineering positions above that of Trainee before they completed the program. Two have completed the program and received permanent assignments with the Road Department, one in Maintenance and the other Construction.

In general, the program is satisfactorily accomplishing the purpose for which it was designed. The college graduates are pleased with it because it gives them overall practical experience in highway engineering to complement their education and it assures them a definite

(*Continued on page* 201)

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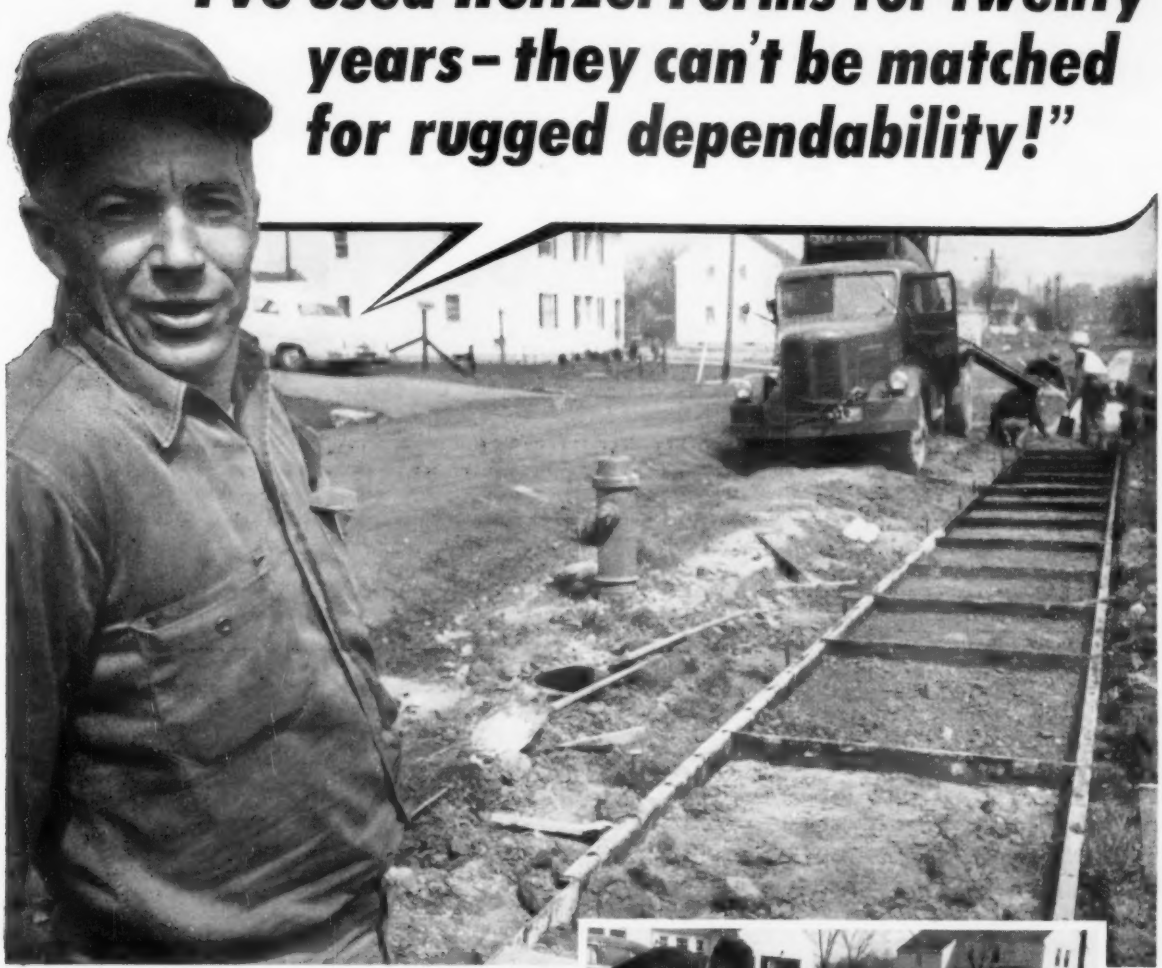

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Corrosion of Small Boilers

To prevent corrosion of small heating boilers, all fittings should be kept airtight; alkaline materials should be added to the water in the proper quantities. A fuel with low sulfur content should be used. The insides of fire tubes should be brushed, flushed, and dried out as often as possible. To remove dissolved oxygen, sodium sulfite should be used regularly in the boiler water. A suitable feedwater heater or deaerator is recommended for reducing the oxygen content of the boiler feedwater. Water leakage and periodic drainage of water out of the system should be avoided.

"Corrosion Problems in Small Heating Boilers." By H. F. Hinst, Babcock & Wilcox Co. *Jour., AWW Ass'n,* January.

Effects of Detergents On Water Coagulation

The authors conducted experiments, using four different combinations of surface-active agents as used in household detergents to learn their effect on coagulation with alum. Two of the surface-active agents interfered with alum floc formation at concentrations of 8 to 20 ppm. A third showed no interference at concentrations as high as 25 ppm. The complex phosphates which constitute a large proportion of many synthetic detergents interfered with alum coagulation at concentrations of approximately 1 ppm. They reverted to the less troublesome orthophosphate very slowly; therefore their effects may be noted many miles down stream from the source of pollution. Their interference could be overcome by substantial increase in the alum dosage where the water being treated was soft; but where the water was hard the floc formed was fine and settled slowly.

"Effects of Synthetic Detergents on Water Coagulation." By Russell S. Smith, Jesse M. Cohen and Grayham Walton, The Robert A. Taft San. Engr. Center. *Jour., AWW Ass'n,* January.

Multiple-Bed and Mixed-Bed Demineralizing

In demineralizing by use of ion exchange resins, two systems are in use—one using two types of exchangers in succession, the other using them combined in a single bed. The author, comparing the two methods, gives the following advantages of mixed demineralization: it results in extremely high purity of effluent, removing the last traces of silica, soluble iron, and other salts; use of only one vessel often effects savings in equipment costs and is well adapted to small flows; and chemical costs are often reducible by regenerating at low levels without effecting the effluent quality. Among its disadvantages are: a major fraction of total plant capacity is out of service for regeneration or maintenance; the re-

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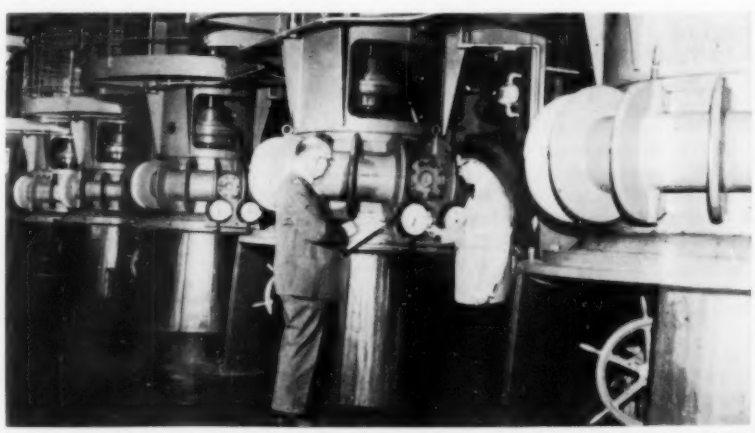
Water for the system is taken directly from the Niagara River and the four low lift Worthington units pump the raw water, which is generally free from any large impurities, deliver it directly to the chemical purification building. After purification, the six high lift pumps deliver the water to the city main.

According to J. A. Fish, Director of Water, the average daily flow is now between 43 and 44 mgd; with a summertime average increasing to 50 mgd. A record occurred last summer when the station pumped 61 million gallons to the city main in one day. The Niagara Station serves the City of Niagara Falls, villages of Lewiston, Youngstown, Ransomville and a number of water districts in the town of Niagara.



● **CHARTING gauges on high lift Worthington pump at Niagara Falls filter plant.**

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generation process and controls are extremely complicated; mechanical degasification is impossible; and the system is vulnerable to contamination by iron, high hardness or turbidity in the influent water.

Advantages of the multiple-bed system are: regeneration is simple; controls of proved reliability can be used; full capacity flow can be maintained during regeneration if the size and number of units are selected properly; carbonic acid can be removed mechanically; removal of turbidity and iron by the cation unit protects the sensitive anion exchange resin. It is possible to produce an effluent containing very low solids and silica, or to permit numerous economies not readily available in mixed-bed operation. Disadvantages are: multiplicity of tanks and operations, and cost of multiple units.

"Mixed-Bed and Multiple-Bed Demineralizing Systems." By H. E. Bacon. *Jour., AWW Ass'n*, January.

Cloud Seeding Increases Water Supply

The author presents figures of results obtained on watersheds of Dallas, Texas, El Dorado, Kansas, and Greensboro, N. C., in support of the statement that effective cloud-seeding programs could materially affect water shortages, and minimize the need for construction of new storage capacity.

"40% More Rainfall." By Irving P. Krick, Pres., Water Resources Development Corp. *American City*, February.

Installing Meters In Baltimore, Md.

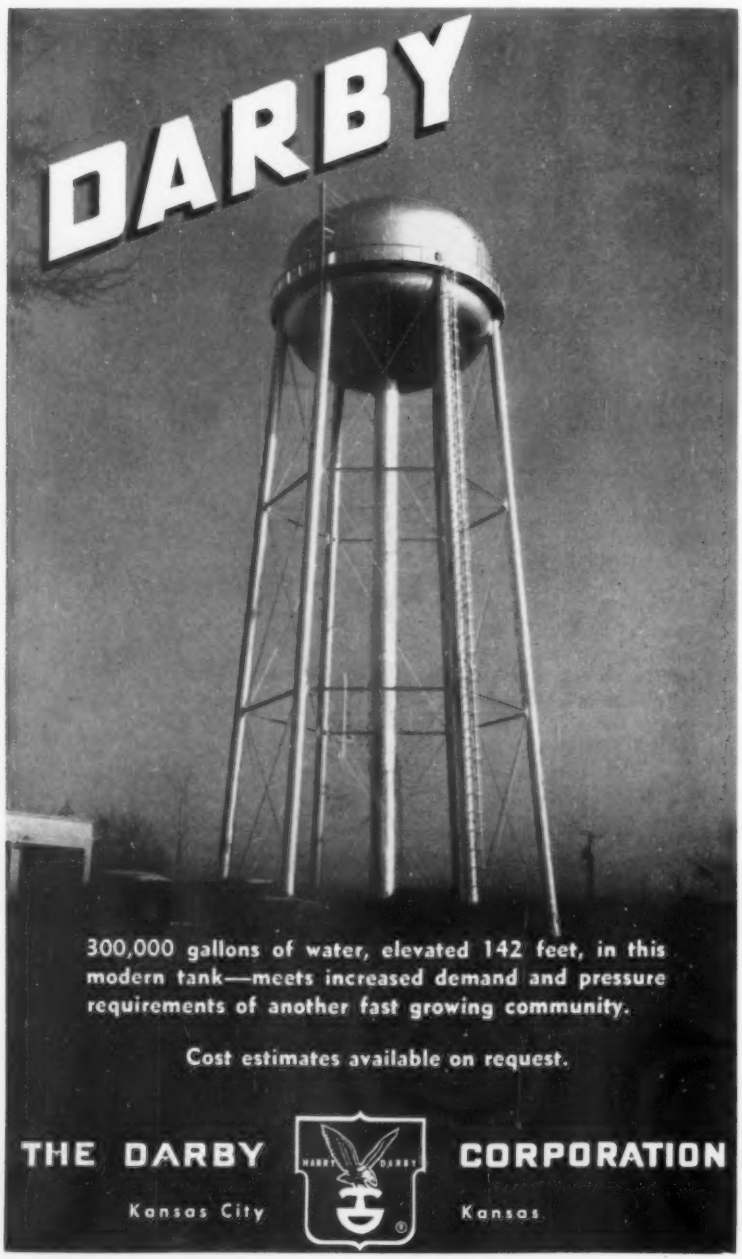
Baltimore is carrying out a program of installing 60,000 meters, placing them in vaults inside the curb line. They have been installed at the average rate of 200 a month, but the rate is being increased, with an ultimate goal of 5,000 a year. Because of the large number, and to minimize the inconvenience to consumers whose supply must be discontinued while the meter is being cut in, every effort is being made to expedite the work. Most of the meters are being installed in old services, many of which were badly corroded and could not be threaded to connect with the meter yokes. To solve this problem and also save time, the yokes on about 80% of the installations are being connected by means of mechanical type compression couplings. Badly corroded services between the main and the curb line are replaced with copper tubing.

In making the installations, one crew makes the necessary excavation and installs the meter yokes with jumpers; then concrete vaults were placed, and cast iron frames and vault covers set on them. Then another crew installs the meters themselves.

"Speeding Installation of 60,000 Water Meters." PUBLIC WORKS, March.

Synthetic Detergents In Water Treatment

Detergents pass through sewage treatment plants with little change, and therefore may be found in water supplies drawn from streams that receive effluents from such plants. The presence of detergents may cause foam on settling basins; taste and odor problems; coagulation and sedimentation difficulties; iron removal difficulties; foaming of finished water; and quality deterioration in the distribution system. Chlorine dioxide can only partly reduce tastes and odors produced by detergents, even if used in high dosages. A cation material is effective but not practicable for public water supplies because it is a strong skin irritant. Activated carbon is effective but high dosages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are required and even these are ineffective beyond a certain point. Coagulation with aluminum sulfate, activated silica, and chlorinated ferrous sulfate is effective to a limited degree. Settled sediment which has been concentrated by an hour's further settling is most effective in removing detergents; after four cycles the sediment loses its capacity to adsorb surfactive substances. Effective to a limited degree are certain physical forms of precipitated calcium carbonate, or a volcanic clay such as bentonite. Data indicate that the removal of detergents is a surface adsorption phenomenon. Tripolyphosphate interferes with alum coagulation in concentrations as low as 1 ppm in raw Lake Michigan water.

"Effects of Synthetic Detergents on Water Treatment." By J. C. Vaughn, R. F. Falkenthal and R. W. Schmidt, Chicago's South Dist. Filtration Plant. *Jour., AWW Ass'n*, January.

Removal of Hardness, Gas, Iron and Manganese

The water supply at Estherville, Iowa contained 790 ppm of total hardness, 1.5 ppm of iron and manganese, and objectionable quantities of hydrogen sulphide. Aside from the objections of consumers to such water, the water meters were so affected that they registered less than half of the water pumped. Of the 3 mgd required by consumers, those using 1 mgd would be satisfied with untreated water, while some of them, notably greenhouses, would find zeolite-treated water objectionable because of the high sodium content of such water. Therefore two supplies are provided. This was possible at little extra cost by laying transmission mains from wells to treatment plant past the plants desiring raw water, while the treated water would be distributed from the treatment plant through existing mains. Two elevated storage tanks are used, one for each supply. The cost of treatment and dual supply has necessitated rates three times the original ones, but the elimination of necessity for home softener service charges has largely offset this additional cost and there have been few complaints about the higher rates. The improved accuracy of customer meters has reduced the unaccounted-for water to less than 10 percent and thus permitted a rate reduction of about 13 percent to the average residential user.

"De-Hardened, De-Gassed, De-Ironed, De-Manganesed Water Supply." By M. S. Smith. *Water Works Engineering*, February.

The attractive new outdoor Beachwood Swimming Pool in Pittsburgh, Pennsylvania is one of the finest examples of modern pool design. Its 328,000 gallon capacity is kept invitingly clear with the use of Adams Poro-Stone Filters.

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Effects of Detergents On Rapid Sand Filtration

Tests were made on filters the sand of which was coated with stearate to simulate a hypothetical accumulation of surfactant. These gave removals of bacteria and of aluminum as good as those obtained with clean uncoated filter sand; but head losses increase at a greater rate in a stearate-coated sand filter than in a clean sand filter, when the filter influent is supersaturated with respect to air. Adsorptive forces between the floc surfaces and the sand surfaces do not play a major role in the removal of floc by rapid sand filters. Concentrations as high as 20 ppm of a polypropylene benzene sulfonate type of surfactant introduced into the coagulated and settled influents of clean sand filters do not reduce their efficiency for removal of bacteria or of aluminum; 5 ppm concentrations of such surfactant introduced into such influents cause head losses to increase at a significantly faster rate than in control filters, but 3 ppm showed no effect. The levels at which the alkyl benzene sulfonate component of synthetic detergents begins to show a direct adverse effect on the filtration process itself appear to be well above those reported and reasonably anticipated in water treatment practice. These conclusions are based on laboratory tests only.

"Effects of Synthetic Detergents on Rapid Sand Filter Performance." By Lawrence H. Sanford and Charles D. Gates, School of Eng., Cornell Univ. *Jour., AWW Ass'n*, January.

Iron and Manganese In Water Supplies

Both iron and manganese occur in water in much the same forms, cause the same types of troubles, and can be reduced to insignificant amounts by the same removal processes. The author describes the forms in which they appear, the causes of their presence, and the processes employed for removing them. These include aeration, settling and filtration; the cold lime-soda process; or a zeolite process. Methods of preventing iron pickup in mains are described.

"Municipal Iron and Manganese Removal Processes." By Eskel Nordell, The Permutit Co. PUBLIC WORKS, March.

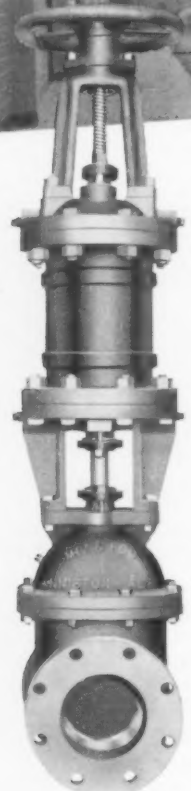
Who Pays Cost of Moving Water Mains?

The State Highway Commissioner of Virginia brought proceedings to adjudicate whether he or a village water company should pay for moving water mains in connection with lowering a highway grade. The trial court decided that the water company had the prior rights and should not pay the cost. The Supreme Court of Appeals of Virginia held that the highway department had rights superior to those of the water company, and that the latter must pay the cost.

"Water Company Compelled to Move Water Lines at Own Expense in Highway Improvement." PUBLIC WORKS, March.

Gravel-Packed Wells Material for

The gravel used for packing in making gravel-packed wells should be so sized and graded that the voids in the gravel will be small enough to retain the fine sand of the water-bearing formation but still have high porosity and permeability. There is a definite relationship between the effective size of the gravel material and that of the formation sand which will insure sand-free operation. The uniformity coefficient of the gravel should be below 2.5. The author describes at some length how to use



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sand screens and analysis curves in grading the packing material. The screen slot openings are to be selected on the basis of the fineness of the sand, the shape of the sand curve, and the relative positions of the various strata of material of different degrees of fineness that make up the entire water-bearing formation. The slot openings should let some of the finer sand come through the screen. For fine uniform sand, at least 50 percent should be retained by the screen.

"How to Use Sand Analysis Curves." *The Johnson Drillers Journal,* January-February.

Effect of Detergents On Chemical Coagulation

Retail synthetic detergent products vary greatly in their effect on chemical coagulation of natural water; some increase the coagulant requirements considerably, whereas others show no effect. The alum dosage required to attain a specified color removal varies linearly, with the concentration of interfering retail synthetic detergent products in solution; but most of those in use have no adverse effect in concentrations up to 10 ppm, a level greater than that normally encountered in public water supplies. Interference with alum coagulation is caused by the complex phosphate builder compounds, with minor supplementary effect from sodium carboxymethylcellulose. It is believed that the complex phosphates have their greatest effect in their ability to precipitate and complex aluminum ions.

"Effect of Synthetic Detergents on Chemical Coagulation of Water." By David H. Howells, U.S.P.H.S., and Clair N. Sawyer, Prof. of San. Chemistry, M.I.T. *Water & Sewage Works,* February.

Progress in Saline Water Conversion

The Director of the Saline Water Conversion program of the Dept. of the Interior, David S. Jenkins, reports for 1955 that distillation shows much promise of attaining considerably lower cost levels. The performance of membranes, both electric and osmotic, justifies continuing support. Developments in solar distillation are encouraging. Freezing processes have inherently low cost if a rapid and economical method of separating pure ice from the mother liquor can be developed. Estimates of cost made by investigators are generally too optimistic. The most promising processes so far developed appear to be able to produce fresh water at costs comparable with the maximum present costs of industrial water supplies under exceptional conditions of service. On present showing, distillation processes are well adapted to seacoast use, while selective membrane processes seem better adapted to inland regions. Disposal of wastes produced by the various processes have to be considered.

"Saline Water Conversion Progress in 1955." PUBLIC WORKS, March.

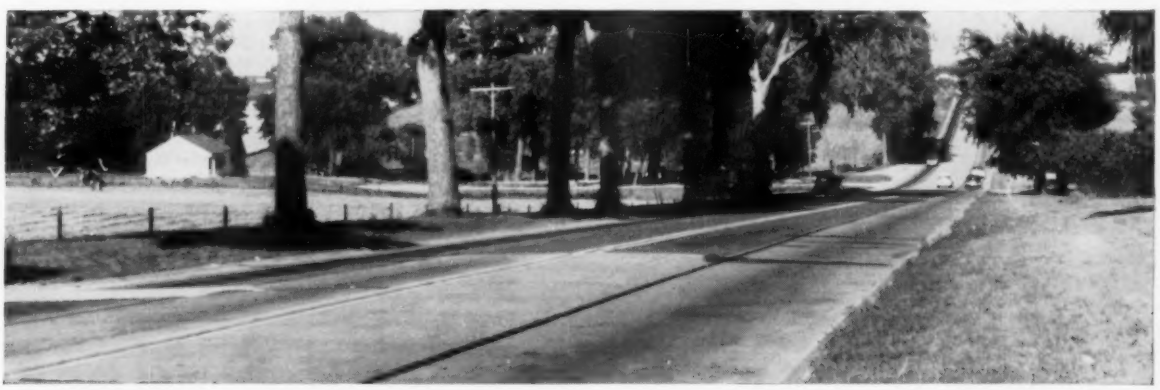
Other Articles

"**Corrosion of Brass** by Chloromine." By T. E. Larson, R. M. King and L. Henley, Ill. State Water Survey. Jour., AWW Ass'n, January.

"Chronic Toxicity of **Cadmium and Hexavalent Chromium** in Drinking Water." By C. F. Decker, C. A. Hoppert and R. U. Byerrum, Mich. State Univ. Jour., AWW Ass'n, January.

"The Pipeline Is Better Than New." The 50 to 72-inch steel Hetch Hetchy **Aqueduct was cleaned** and lined with cement. By Harry E. Lloyd, Mgr. American City, February.

"**Field Monitor,**" a new tool in the application of the millipore filter to microbiology. Public Works, March.



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"Legal Meaning of **Water Rights.**" By John H. Murdoch, Jr., Chief Counsel, Am. W. W. Service Co. Water & Sewage Works, February.

"**Aeration.**" The 27th of a series on "Water Works Practices." By George E. Symons. Water & Sewage Works, February.

"Dollar Savings Through a Sound **Safety Program.**" By Wendell R. La Due, Chief Eng. of Water Supply, Akron, O. Water & Sewage Works, February.

"Water for the Booming **Suburbs" of Chicago.** Proposal for future supplying of water to towns within a radius of 40 miles. Engineering News-Record, Feb. 23.

Plastics in Water Supply

(*Continued from page* 128)

high pH, high chlorides, high naturally occurring fluoride, hardness, high mineral content, high sulfates, and high carbonates. It was found that Ann Arbor water could be made more aggressive in the extraction of heavy metals from plastic by lowering the pH through the introduction of carbon dioxide gas. A pH of 5.0 was used because it was felt that water of lower pH would not be used for a potable supply without adjustment. This water was used throughout the work for the water contact and extraction tests.

Test Results

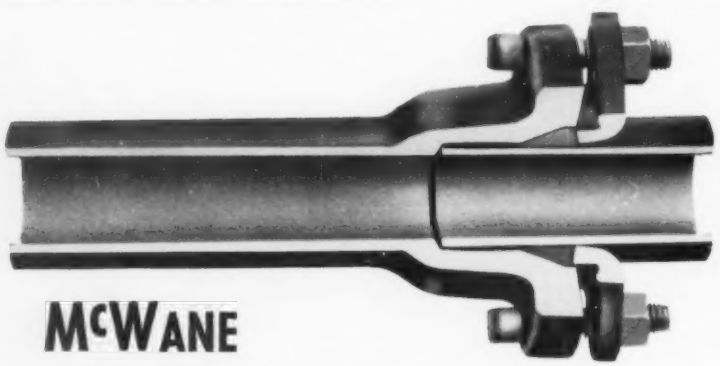
Weathering: To test the air contact prepared sections of the samples of plastic pipe were exposed to natural weathering for a period of one year under standardized conitions. There were slight changes in color in a number of instances and a fine surface film formed on the samples of rubber modified polystyrene.

Effect Of Soil: Test specimens buried in an acid soil of pH 2.0 and held at 35° C for one year, with intermittent wetting and drying to simulate rainfall, using distilled water, showed very little effect on any of the test plastics. This soil was obtained from the grounds of a chemical plant at which an underground line of galvanized steel pipe had been attacked by the soil to the point of developing leaks within a year after it was laid. Some discoloration of samples was noted and also a tendency to form a thin film at the soil-plastic interface.

Water With Air Interface: Specimens of plastic pipe held partially immersed in the test water in sealed large-capacity glass stoppered bottles for one year at 35° C., showed slight color changes, slight film formation and, in some instances, a slight fungus growth. In comparison, copper tubing under identical conditions showed a fine black sediment and galvanized steel pipe was covered with a heavy white floc.

Rodent Attack: Well controlled experiments indicate that plastic pipe in all four classifications is susceptible to rodent attack when it obstructs access of the rats to food. This was most pronounced with polyethylene, probably because of the softer nature of this formulation. Plastic pipe was attacked by both *Rattus norvegicus* and *Rattus rattus*. There was no evidence that the rats ate the plastic nor that they gnawed it in preference to other substances.

Extraction Tests: A procedure was developed for subjecting cut specimens of plastic pipe to extraction by aggressive water. The results of these extractions showed that it was impossible to extract any deleterious substances from any of the samples tested which were recommended by the manufacturers for domestic water supply use. This was true even though the pH of the water used was lowered artificially to about 5.0 to make it more aggressive. Natural waters do have pH values as low as 5.0.



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McWane 2-inch and 2¼-inch CAST IRON PIPE in 20-foot laying length is the newest member of the McWane Super-DeLavaud Centrifugal Pipe family. It has all the well known characteristics of Super-DeLavaud pipe — smooth, straight barrel, even wall thickness, sound metal section, easy to cut and easy to tap.

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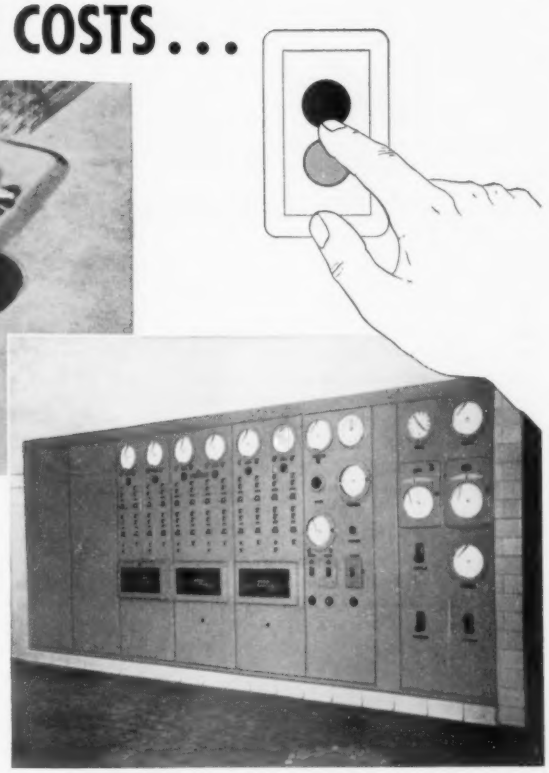

Central control panel in pump and chemical feed building. From this board, the filter effluent and backwash rates are remotely controlled by means of Builders Auto-Central Control. ▶

The same type of automatic time-sequence operation which has won such wide acceptance for automatic home washing machines now comes to the modern water works. Here is one of the first installations of Builders Auto-Central (automatic-centralized) filter Control, proven by over three years of successful operation at the Alexandria Water Company in Alexandria, Va.

Builders Auto-Central Control has many advantages: It saves time — relieves plant personnel for other duties. It eliminates supervisory headaches. It insures accurate backwash rates, proper washing times, and helps to maintain maximum filter efficiency. It reduces construction costs by eliminating the need for shelter over conventional operating tables.

Here's how Builders Auto-Central Control backwashes a filter: A Builders Loss-of-Head Gauge signals the need for filter backwashing. The pumping station operator (there's only one per shift!) pushes a button which starts the backwash cycle for the proper filter. The Sequence Controller and Pneumatic-Hydraulic Valve Positioners then complete the washing cycle step by step, and return the filter to normal operation TOTALLY UNATTENDED.

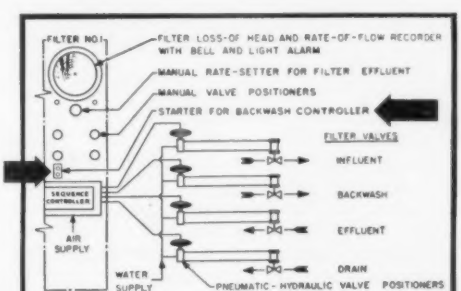

Diagram of control panel for Filter No 1.
Operation may be manual or automatic as desired.

Auto-Central Filter Control is another example of Builders' pioneering in the water works field. For complete details on this or other types of Builders Water Works Equipment, write Builders-Providence, Inc. (Division of B-I-F Industries, Inc.), 356 Harris Ave., Providence 1, R. I.

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Taste And Odor: In the taste and odor studies, samples of water, which had been in contact with cut plastic pipe for three days at 35° C. with occasional agitation, were submitted for examination to a five-member panel selected for acuteness in differentiating odors and tastes. As controls, samples of the unexposed test water, of water exposed to copper pipe, and of odor free water were added to those to be examined. All were simply numbered at random and were submitted to the panel as unknowns.

The results showed no greater intensities of odors, as determined by the standard threshold odor test, in any of the samples exposed to plastic pipe, than in the controls. Panel members described the odor and also the taste, although it is recognized that odor necessarily influences taste. The characteristics of the odors and tastes appeared to be about the same for the standard water and copper exposed controls as for the waters exposed to plastic pipes. There was a tendency to describe the odors and tastes as chemical or medicinal which may be due, to some extent, to the fact that the test water was chlorinated.

It should be remembered that exposure conditions were purposely severe in these tests and probably will not be duplicated under any actual use conditions.

Additional odor and taste tests were run on samples of test water that had been recirculated in systems of plastic pipe. This was done in order to introduce the possible effects of fittings and of compounds used in joining the pipe and fittings, and to simulate a water supply system. Two differences which increased the severity of the test were that the water was at room temperature and was recirculated being alternately pumped for 30 minutes and allowed to stand quiescent for 30 minutes throughout the 3 to 7-day period of exposure. None of the samples tested gave threshold odors greater than the controls nor abnormal odors or tastes with one exception.

In this instance, on first trial, the highly volatile solvent or the cement used for making joints in the cellulose acetate butyrate system, following manufacturer's instructions, gave a pronounced undesirable odor and taste to the recirculated water. The threshold number was 150. However, after the system was emptied and air run through for several hours, followed by flushing with water, a repetition of the test gave odors and tastes similar to the controls. Nevertheless, the empty system, after standing several days, gave off the characteristic odor of the solvent. It is understood that the manufacturer is changing the solvent.

Chlorine Residuals: In tests to determine the effect, if any, of plastic pipe on chlorine residuals in water it was found that in no instance was the reduction in free chlorine residual so rapid as to change materially the effectiveness of the chlorination of tap water.

Disinfection of Plastic Pipe Systems: Recirculating systems of each of the four general types of plastic pipe under study were heavily seeded with cultures of *E. coli*. After prolonged exposure the water was drawn off and the system subjected to disinfection using approximately 200, 50 and 25 ppm of hypochlorite respectively. After 15 to 24-hour contact with the circulated chlorine solution, it was discarded, the system flushed with fresh tap water, rinsed with dechlorinated water, and the rinse water examined for the presence of *E. coli*. Although small residuals of *E. coli*. were recovered following treatment, in some of the test procedures, these numbers were so small as to come within the criterion of chemical disinfection ordinarily considered to be satisfactory. The results indicate that such systems can be satisfactorily disinfected following standard disinfection procedures.

In experiments using high concentrations of chlorine on the various plastic classifications no adverse effects were noted on the plastics after 20-hour exposure at 10° C. Adverse effects on copper and galvanized steel specimens were noted, however, when these were held under similar conditions. Higher than usual concentrations of chlorine may be used in the disinfection of plastic pipe without damage.

Animal Feeding: Studies were made of Wistar strain rats which drank, exclusively for 18 months, water that had been held in contact with various groupings of plastic pipe. This included a group containing substances such as lead and cadmium which had been found to be extractable with the test water. Also, a control group of rats was observed, which drank exclusively the test water without contact with plastic, and another group, which drank only the test water after contact with copper pipe. Observations and tests, of rats dying or sacrificed before the expiration of 18 months, as well as of the 36 sacrificed at the end of that period, showed no appreciable abnormal effects as compared to the control group. Growth, food consumption, and water consumption were similar in all the groups. The results of autopsies, as appraised by an expert, Dr. Carey P. McCord, showed no evidence of any damaging action finally attributed to the test plastics.

The groups of rats, fed on water in contact with special specimens of plastic pipe containing lead, cadmium, and barium, did not show excessive amounts of lead in the blood at the end of the feeding period.

Practical Application of Results

The reported favorable results apply to the particular formulations of plastics tested. It remains to identify these formulations so that the man in the field may identify them on the job and to provide for the testing and similar identification of new formulations. A plan has been developed calling for the testing, regular retesting, and listing of plastic materials satisfactory for potable water supply use; with certification to pipe extruders of such materials. The plan also calls for the marking of approved plastic pipe at intervals of not more than 18 inches with the National Sanitation Foundation's seal consisting of the letters nSf and optionally the addition of the words "Drinking Water". Authority to use this seal is based upon a preliminary inspection of the extrusion plant with reinspection as often as required, but at least annually; and also the retesting of samples of extruded pipe as required, but at least annually. The right to use the seal of approval may be withdrawn at any time for failure to maintain required standards.

This study has shown that plastic pipe of certain types including those commonly recommended by the manufacturers for water supply use when properly installed does not introduce toxic substances; affect color, flavor, or odor of the water; nor interfere with maintaining chlorine residuals in such water, nor in the disinfection of new pipe lines by the standardized procedure. A plan has been developed and now is in effect for placing a controlled hallmark on plastic pipe which on test has been found to be suitable for use with potable water supplies thus giving the engineer a practical basis for identifying and specifying plastic pipe suitable for this use. Other criteria must be used to select pipe for its physical characteristics.

This is a portion of a paper presented by Mr. Tiedeman at the ASCE meeting in Dallas, Tex. It is published with the permission of The American Society of Civil Engineers and Civil Engineering.

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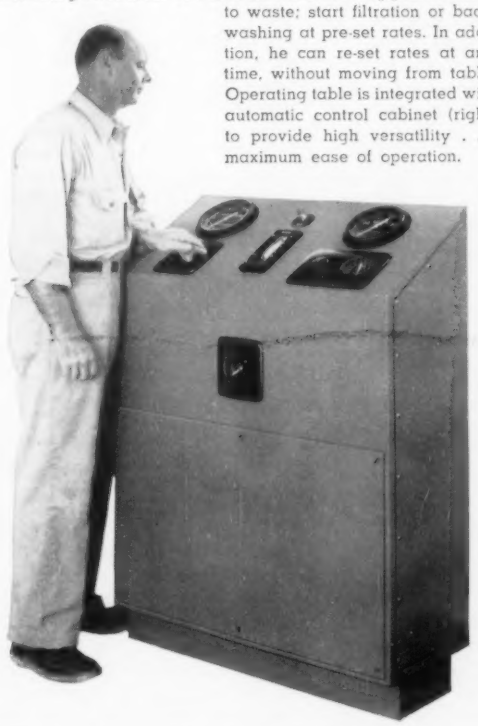
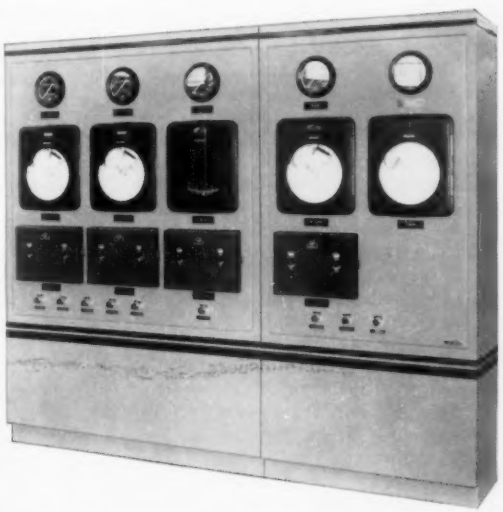
This trim, new municipal water treatment plant at Fairfield, Cal., is ultra-modern inside and out. Automatic control of the plant's four rapid sand filters is handled by the highly flexible Foxboro System shown in the accompanying illustrations. *Contractor: C. Norman Peterson, Co., Berkeley, Cal. Consulting Engineers: Solano Engineers Associated, Vallejo, Cal.*

Supt. Charles A. Crane turns "finger-tip" control selector switch on one of four Foxboro Master Operating Tables at Fairfield plant. Using switch, he can shut off influent or by-pass effluent to waste; start filtration or backwashing at pre-set rates. In addition, he can re-set rates at any time, without moving from table. Operating table is integrated with automatic control cabinet (right) to provide high versatility . . . maximum ease of operation.





Five instruments across center, l. to r., are recording and integrating — or controlling — influent and effluent flows, clearwell level, backwash rate, and effluent temperature. Timers (beneath) operate with influent flow recorder to proportion chemicals to influent.

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THE INDUSTRIAL WASTE DIGEST

Ground Disposal Of Radioactive Wastes

The disposal of liquid radioactive wastes present treatment and disposal problems because of large volume, high levels of radioactive contamination, fluidity, acidity, or high salt content. The operation and maintenance of nuclear power reactor installation will produce several types of wastes of which the high-level wastes that result from fuel processing are of greatest concern. Radioactive wastes from chemical processing are now stored in large steel or concrete tanks for indefinite periods of time because of present uncertainties regarding ultimate disposal. This is regarded as a temporary expedient until methods of ultimate disposal can be developed and evaluated. The costs range from 37 cents to $2 per gallon. There are other definite limitations. Consideration is being given to the possibilities of disposing of high level wastes to the oceans and to ground disposal. Soils have the property of absorbing or exchanging ions from solutions in contact with them. Because of the large volumes of soil available in most locations, its potential capacity for sorption of wastes is great. Shallow ground pits of suitable design may be safer waste receptacles than structural tanks. A major limitation in the application of complete retention in soil pits is that impermeable soil formations are generally nonexistent. Research and development followed by experimental field installations are needed in hydrologic techniques and materials and designs for making pits completely retentive. Disposal of radioactive waste into pits for partial retention and seepage will depend upon adequate adsorption and ion exchange capacity of the soil, conditions of ground water movement which must be studied including stratigraphy, texture, porosity and other properties.

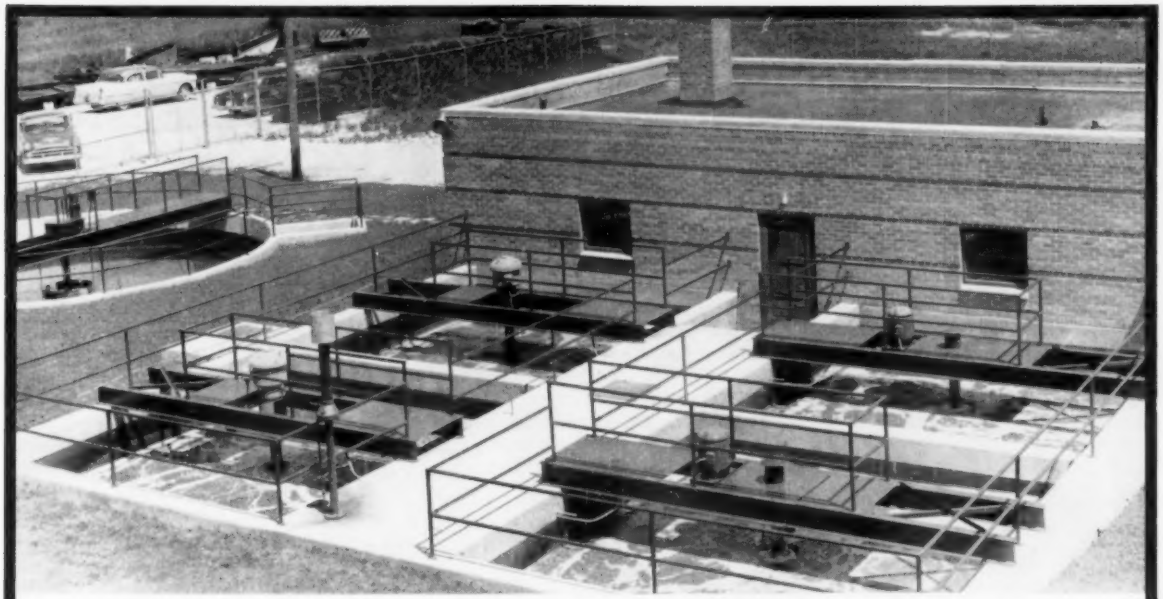
The system of waste disposal at Oak Ridge National Laboratory (ORNL) includes use of local ground areas to aid in the disposal of low-level, intermediate-level, and ultimately, of high-level liquid radioactive wastes. Low-level wastes which has been disposed of by dilution through White Oak Creek into Clinch River, will be treated to decontaminate the wastes partially by coagulation and water-softening processes. Sludge from the process is to be disposed of in waste pits within the controlled area of ORNL. Three waste pits have received about 2 mg of salted, highly alkaline liquid wastes containing about 27,000 curies of beta activity. Sampling and radiologging wells have shown that radioactive ruthenium having stable nitrates pass through the shale formations. No evidence of radioactive cesium or any other radioactive cations has been observed in any of the wells in the four years the pits have been in operation. Pit construction cost of about 1.5 cents per gallon of waste capacity may be compared to 75 cents per gallon of capacity for a gunite-lined, steel tank. Experience in field and laboratory shows that pit disposal may be promising and may serve for the disposal of high-level wastes; however, additional studies are indicated before pit disposal may be applied directly to high-level wastes. "Ground Disposal and Radioactive Wastes," by Roy J. Morton and Edward G. Struxness. *American Journal of Public Health*, February, 1956.

Synthetic Detergent Treatment Studies

Increased problem of frothing in sewage treatment plants and rivers is attributed to (1) the rapidly increasing use of synthetic detergents, or (2) the introduction of new and more biologically resistant syndets. Early work on the problem of frothing was done on retail products sold under trade names without definition of actual composition. Studies performed on the basis of syndet composition included suseptibility of the materials to biological oxidation measured by the standard five day BOD test using seeding materials from natural sewage and acclimated sludge; the behavior of the syndets in a sewage treatment plant as judged from oxygen utilization determinations in mixtures of activated sludge; and the persistence of syndets in natural bodies of water by examination of various samples collected from rivers to which 5 ppm of the syndet was added. Anionic and non ionic detergents appear to be subject to biological attack but may vary greatly in susceptibility depending on differences in chemical structure and molecular size. Acclimation of biological forms is an important factor. Tetrapropylene benzene sulfonate, which is the most important detergent in terms of present day use, is extremely resistant to oxidation with an indicated half life of about sixteen days in river water under summer conditions. "Biochemical Behavior of Synthetic Detergents." By Clair N. Sawyer, Richard H. Bogan, and James R. Simpson, Massachusetts Institute of Technology. *Industrial and Engineering Chemistry*, February.

Predicting Air Pollution Problems

In evaluating the potential air pollution problem of an industrial plant, the kinds of data needed fall into three general groups: (a) sensitivity of polluted areas; (b) meteorological characteristics; and (c) plant and topographical characteristics. Complaints of damage are valuable sources of information on the question of sensitivity of the area in the case of an existing plant. For a new plant, analysis of situations likely to produce complaints is needed. Wind speed and direction are the most important meteorological characteristics to be studied. Data for determining atmospheric air density might involve air temperature Aerial photographs should be helpful in examining topographical features especially for projection of these features into the model study. Wind tunnel studies can be useful in evaluating the problems of plant modification, particularly with regard to configuration of the plant. Variability



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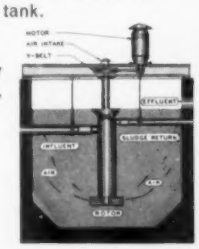

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in thermally induced atmospheric turbulence presents the greatest problem and should receive more attention in further wind tunnel investigations. "Wind Tunnel Scale Model Studies of Air Pollution from Industrial Plants." By Gordon H. Strom, New York University, *Industrial Wastes*, January-February

Acclimated Cultures Used for BOD Tests

The BOD determination is the chief analytical tool as the parameter for biological oxidation; however, there has been a growing desire for a procedure to replace this determination. It is indicated that assumptions that are applied to the standard BOD procedure can be frequently incorrect. To achieve more complete understanding of reactions involved in the biological oxidation of certain materials, acclimated cultures of microorganisms should be employed. In that event, however, the results obtained are indicative of what may occur naturally when sufficient time for acclimation is provided. The evaluation of the BOD of the material may be undertaken by determining the long term BOD curve using a source of unacclimated microorganisms as seed. If satisfactory results are not obtained, the procedure is repeated employing the acclimated cultures as seed. It is believed that the ultimate BOD developed with acclimated microorganisms is the only reliable BOD value for industrial wastes. "Biological Oxidation Parameter Applied to Industrial Wastes." By E. J. Mills, Jr. and Vernon T. Stack, Jr., Carbide and Carbon Chemicals Co., South Charleston, W. Va. *Industrial and Engineering Chemistry*, February.

How Fast Are Stream-Pollutants Destroyed?

Stream polluting organic chemicals may be classified as those rapidly destroyed in streams or those that persist indefinitely once they enter a stream. Potential damage to a stream by chemicals of the second type is subject to analysis by the usual BOD and dissolved oxygen parameters. A series of investigations was conducted on the persistence of specific organic compounds as a part of the total pollutional complex in aerobic surface waters. A tremendous variation in the rate at which a specific chemical compound undergoes biological attack and limited laboratory investigation may fail to reveal the susceptibility of a compound to destruction. Compounds showing high resistance to biological destruction include ortho and parachlorophenol lignin and lignin derivatives (Kraft wastes). The process of biological purification of a polluted susbstrate has been characterized as the sum of sequential biochemical reactions. A chemical resistant to biological destruction may be capable of more damage to a stream than depleting dissolved oxygen. "Biochemical Oxidation Characteristics of Stream-Pollutant Organics." By M. B. Ettinger, Robert A. Taft Sanitary Engineering Center, U. S. Public Health Service. *Industrial and Engineering Chemistry*, February.

Other Articles

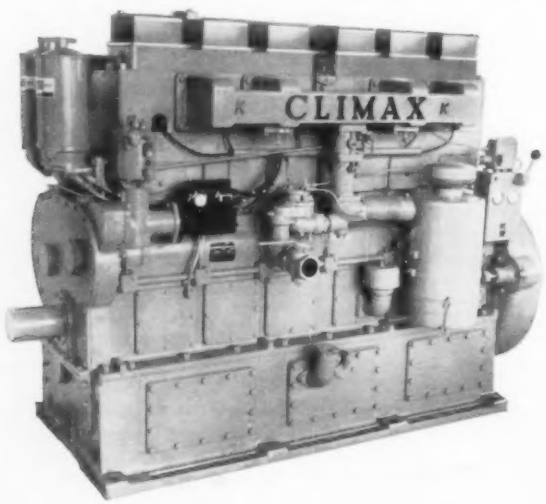
"Full-Scale Modified Digestion of **Meat Packing Wastes**" by the anaerobic process. By Alfred J. Steffen, Wilson & Co. Sewage and Industrial Wastes, December.

"Fundamentals of the Control and Treatment of **Dairy Wastes.**" By H. A. Trebler, Milk Industry Foundation, and H. G. Harding, Nat'l Dairy Research Lab. Sewage and Industrial Wastes, December.

"Treating **Wool Processing Wastes.**" Report of Stream Pollution Abatement Committee of Am. Ass'n of Textile Chemists and Colorists. Public Works, March.

"How to Treat **Meat Wastes** by Filtration with Sewage." Wastes Engineering. February.

"**Naphthalene Recovery** Converts Pollution Into Profits," by the flotation process. By H. J. Gisler, Denver Equipment Co. Wastes Engineering, February.



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Records for County Bridges and Culverts

WESLEY D. SMITH
Assistant Engineer
Hamilton County, Iowa

This article is based on a paper presented at the Iowa County Engineers' Conference

A SYSTEM of numbering bridges and culverts which is simple to use was developed in Hamilton County in 1916. Our County has four tiers of four townships each, a total of 16 townships. Each township was given a letter of the alphabet in the following manner: The township in the northeast corner of the County was given the letter "A". Each succeeding township was given a letter working down the alphabet. The top tier was lettered east to west, the second tier west to east, the third tier east to west, and so on. The letters "I" and "J" were omitted, so we start with "A" in the northeast corner and end with "R" in the southeast corner. Each bridge or culvert is prefixed by the letter of the particular township and the section number where the structure is located. Then the bridges or culverts are numbered consecutively starting at the northeast corner of the section, proceeding west on the north section line, then south on the west section line. The structures located in the interior of a section are numbered last. For an example, the first structure on the east end of the north County line would be listed as A11.

All field books are kept on file in the engineer's office. Originally, one field book was used for each township. Field construction notes, repairs and high water information on all structures in that township were entered in this book. Recently, due to more detailed plans, construction procedures and records, one field book is used and filed for each construction project.

A comprehensive record is kept of all bridge and culvert lettings, with each letting on a separate sheet. Each sheet indicates the type and quantities of work, the unit price and total bid of each bidder, and the names of competing firms. This information is very useful in preparing estimates for work under consideration.

As soon as a project is completed, the plans are checked, additions or deletions entered, and the plans filed in a post binder. Each tier of townships has a separate binder and all plans are filed numerically and by township. We have a fairly complete list of plans on file going back as far as 1915.

Bridge Capacity Survey

In 1940 and 1941, when the army was holding maneuvers in Louisiana and Texas, there were many reports of failures of bridges under the loading of military vehicles. At that time the County thought it would be advisable to undertake a visual inspection of all bridges in the County. It was felt that a permanent record should be made and filed for reference and use in future inspections. In 1955, another inspection was made. During this inspection pictures were taken of each structure. One picture shows the roadway and another has a view of the substructure.

Using the information obtained from both inspections, the material was consolidated and entered, along with the pictures, on special printed sheets. The sheets have necessary headings to allow entry of all pertinent information. The bridge number, location, drainage area, grade to bed of creek, and high water information are listed. If the data is available, the year built, the contractor, and the total cost of the structure are shown. The bridges are described as to type, span, and roadway. Details of abutments, piers, floor and rail are given. Under each item described, the condition is reported. On all high trusses the minimum and maximum clearances are noted so that we can easily route high vehicles through the County with no danger of damage.

It is easy to see from these sheets just which structure is in need of repair. When repairs are completed these are entered in the sheets along with the cost. If a bridge is replaced, a new sheet is made and new pictures taken and mounted.

We enter all bridge painting information on these sheets under the appropriate bridge number. In 1955, Hamilton County contracted for the sandblasting and painting of a large number of bridges. All bridges were given a zinc chromate undercoat and finished with chrome green. The rails and truss end posts were finished guard rail white. The survey sheets show which bridges received 3 coats and which received 2 coats. Also, if only the outside of the outside I-beam was painted, this is indicated. We are going to experiment with the use of reflectorized paint on both steel and concrete wing rails and posts. Altogether in 1955, a total of 967 ft. of high trusses, 690 ft. of pony trusses, and 949 ft. of I-Beam bridges were repainted.

We keep a separate field survey book for our reinforced concrete box culverts. The bridge number, location, length and area are given; also the drainage area, the contractor, the cost, the year built, and the condition. We have 363 reinforced concrete box culverts in the County with a total span of 2139.5 ft. Here again, needed repairs or information necessary for the design of a new structure can be found easily.

Rating Map

Recently it was decided to prepare a large scale map of the County and to indicate on the map the location of all bridges. Since we had just received a 1955 traffic flow map from the Highway Commission, it was thought that a combination of the two sets of data would be helpful. A traffic map was prepared using different colors for the heavier vehicle counts. Through the use of all available data and the two field inspections, all County bridges were rated as to load carrying capacity. The so-called "light" bridges are capable of carrying an 8 to 12-ton load, the medium bridges a 12 to 18-ton load, and the heavy bridges any load within reason. Each structure was entered on the map in the correct location with the bridge number and type printed beside the bridge symbol. The symbols are in colors to indicate the rating for the specific structure. Red symbols indicate a light rating, green symbols a medium rating, and blue symbols a heavy rating. By using this map we can route heavy vehicles through the County without endangering the vehicle or the structure. Also, since the bridge rating and daily traffic

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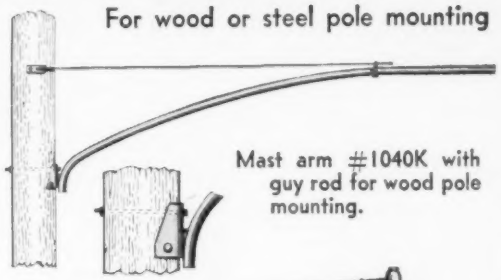
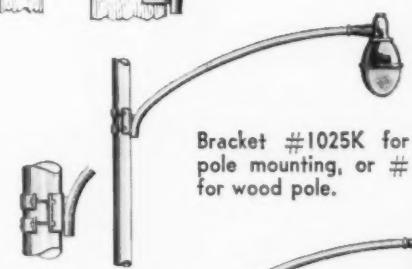
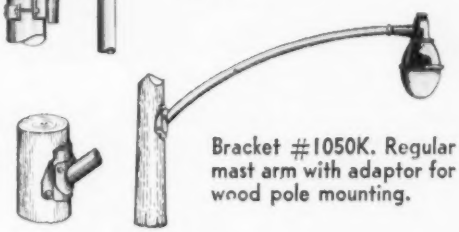


Mast arm #1040K with guy rod for wood pole mounting.



Bracket #1025K for steel pole mounting, or #1035K for wood pole.



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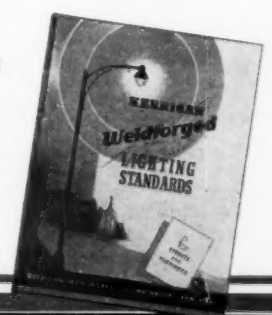

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flow are indicated on the same map, it is helpful in planning future bridge construction.

This year it was felt that a more condensed version of some of our accumulated information was necessary. This was done and the data placed in a binder which might be called the master file. As a rule, any information we want concerning any bridge can be found here. If we want more information, this file will tell us where it can be found, and whether or not we have more data available.

This record is broken down into several sections, each section being headed by a particular bridge type. The headings we use are I-beam, continuous I-beam, concrete slab, concrete deck girder, steel deck girder, concrete through girder, steel through girder, low truss, high truss, wood and corrugated metal pipe. A separate section is reserved for each bridge type for structures located on the County line. The reason for this is that the cost of such structures is sometimes shared by the adjoining county.

Each page in each section is divided into 14 columns. These give the following information: Bridge number; whether or not we have a plan for the structure; the date built; span length; approach length; roadway width; minimum and maximum overhead clearance; type of floor; number and size of stringers; type of abutments and piers; overall condition; load rating; and overall length.

A summary sheet was prepared to enable us to see just where we stand in our bridge program. We have a total of 191 bridges, taking into consideration that a County line bridge is counted as one-half bridge. We have construction plans for 141 bridges dating back to 1915. The summary shows how many bridges we have in each roadway width from 15 ft. to 30 ft. and how many high trusses in each minimum clearance height from 10 to 14 ft. and over. The number of light, medium and heavy bridges with the total lengths of each rating are entered. We have 15 light bridges, 30.5 medium bridges and 145.5 heavy bridges.

We have no all-wood bridges in the County, with the exception of a County line bridge which is the responsibility of Story County. There are 342 ft. of bridges which still have untreated wood floors and 2280 ft. of bridges with creosoted wood floors. The County started the exclusive use of treated lumber in the middle 20's and it is felt that it has been a good investment. In 1954 we built a new 310-ft. structure replacing a bridge that had been rebuilt using creosoted lumber 25 years ago. We have been selling the reclaimed stringers and floor plank at $100 per thousand; $70 per thousand was paid for the new material 25 years ago.

Since it is probable that the light and medium rated bridges will be the first to be considered for replacement as the number and weight of vehicles keeps increasing, a separate file was prepared for these catagories. This file was set up with much the same headings as the previously discussed files. The light and medium bridges were put in separate sections. The bridge number, type, and length of each structure are shown.

Cost Summary Sheet

For comparison purposes, mainly, a cost summary record was prepared. This record summarizes the costs for all bridges built from before 1915 through 1955. The headings indicate the bridge types and under each type for the year selected can be found the number of bridges of that type built in that period. Also the total length is listed, the total cost, and the average cost per foot.

One example will show the use of our records. We desire information on bridge number F.6.6. First we look on the map and see it is rated as a heavy bridge and is a continuous I-Beam. Then looking in our master file under the continuous I-beam section, we can obtain any of the information listed previously. The master file indicates the bridge was built in 1955. If we look in the letting file for 1955, we can obtain more data. Since we know the bridge number, the structure is easily found in the bridge field survey book with pictures and more detailed information. The master file indicates a plan is available and can be consulted in the plan post binder.

• • •

Disaster Preparation

(Continued from page 149)

haps more severe from the planning viewpoint because power lines are often severely damaged and necessary home facilities are lacking.

Essentials in Preparation

First essential in meeting these emergencies is an organization and a plan. This presupposes the cre-

ation of a local group which will establish committees to study local conditions affecting disaster and, from the accumulated data, will prepare an organization and a plan for all major possibilities. In many areas, the nucleus of such a group already exists in the form of a civil defense organization.

A plan must contain sound procedures for meeting an emergency; naturally the program for a fire will differ from that for a flood. In either case, however, there must be provision for communications, transportation, rescue, hospitalization, shelter and food. There must be equipment available, with personnel who know how to use it; and there should be trained auxiliary personnel. Arrangements for mutual aid should be established with nearby communities and with the state. It is important to utilize all available applicable local skills. This will include local public utilities, skills of private citizens—engineers, technicians and skilled laborers—contractors, state and Federal agencies and the Red Cross.

Data for Planning

A preliminary to proper planning is the assembling of data. Planning for floods may include some or all of the following:

Danger areas, as inhabited valleys that have a potential flood menace and low-lying shore areas subject to damage from higher-than-usual tides. Consideration should also be given to dams which may be overtopped or which have inadequate spillways; and to bridges which may collect debris brought down by flood waters and either dam up the stream or fail, or both. Low roads subject to quick overflow, with few sideroads to higher ground may present danger to travelers.

Escape routes from threatened areas should be charted and perhaps marked; warning methods should be developed which will reach such areas promptly with full information. If power lines have been destroyed radio communications will normally be impossible.

Health factors are important. Water lines in flood areas may be damaged, imperiling water quality. There is no quick way to repair such damage, so early notice should be provided to store water in areas not threatened by actual damage, but served by water lines that may be destroyed or temporarily put out of service. In summer, flies and possibly rats may become a nuisance, or conceivably a health problem.

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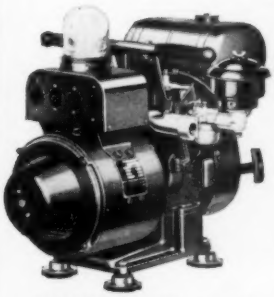

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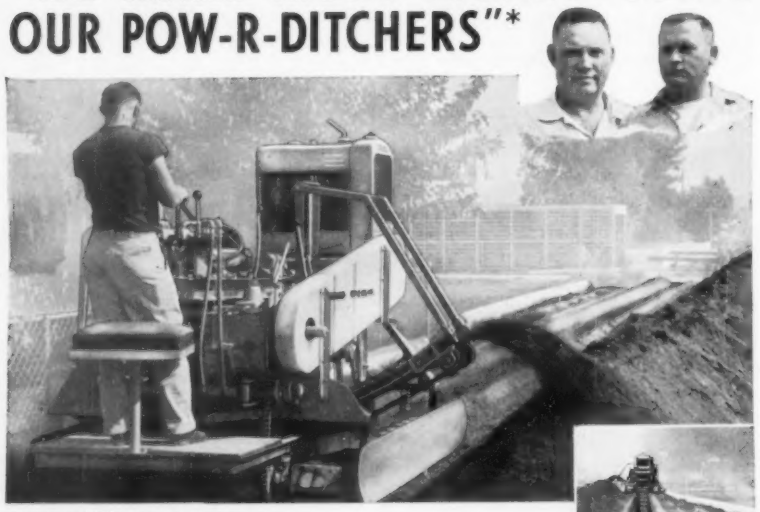

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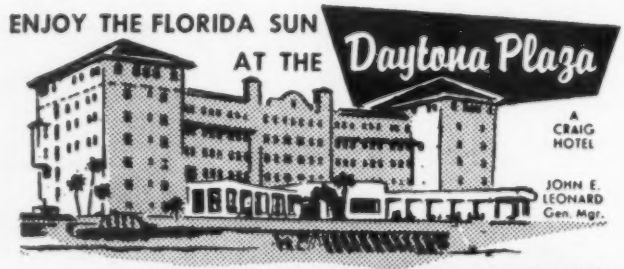

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Rehabilitation will be a big job, with need for maximum effort by public agencies and private enterprise. Public effort will be required to repair and reopen roads; clean or repair sewer lines so they will perform the job they were designed to do; restore water service, with chlorination and other treatment as necessary to provide safe water; and provide sanitation services. It may also be necessary, in warm weather, to initiate an insect control program. Pumping out flooded cellars may be a public or private task, but cleanup—including cleaning up and repairing septic tank installations—will normally be a private job by the homeowner.

For earthquakes, fires, hurricanes and tornados, investigations will cover all or part of the factors discussed above for floods, the more so that hurricanes are often accompanied by heavy rains. Geological advice may be helpful in forecasting greatest danger areas from earthquakes and a geology professor from a nearby or state university may be helpful. Though surveys for fire and flood damage may have been made in the past, these may not be up to date due to local industrial development and to the many new subdivisions constructed in and around most of our cities; and, unfortunately, many of these are in areas which previously had been thought unsuitable for building on.

In considering snow and ice storms, the principal preliminary study should be given to roads, as follows: (1) to main roads to prevent traffic stagnation due to snow or ice and to provide rescue service if needed; and (2) to rural roads, other than main traffic arteries, for safeguarding traffic and for rescue work. Such plans should be coordinated with the city, county and state plowing and salting programs. Expediting the placing of salt can be highly effective in reducing traffic hazards due to ice or packed snow. Communications with the men in the field will be important.

Plans should provide for maximum use of local resources to restore power lines and for outside

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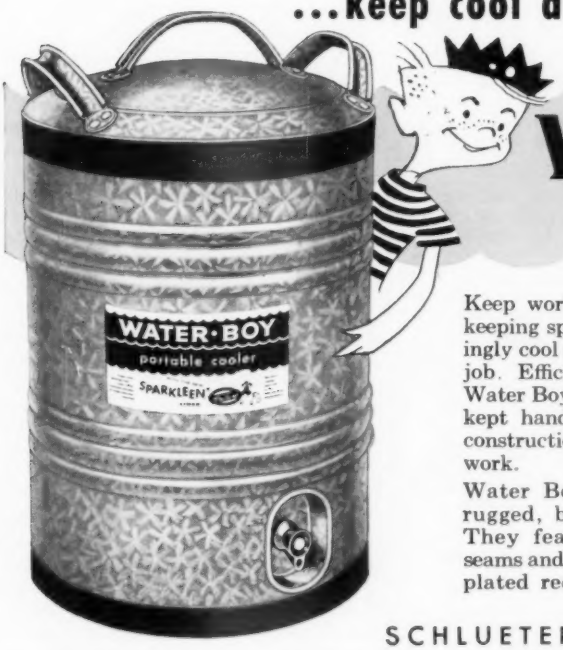

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aid in all cases of major damage to the lines.

With the data at hand, a plan can be prepared for each potential emergency. This will require development of a step-by-step procedure, utilizing skilled men and proper equipment, both public and private. Contractors, for instance, have much equipment which can supplement that owned publicly—bulldozers and motor graders which can plow snow or repair roads; sand spreaders for placing grit or other anti-skid materials; front end loaders; and trucks, to mention a few.

The preliminary plan must be worked out with representatives of the telephone and power companies; the water, sewer and street departments; contractors; the State Board of Health and the State Highway Department; with the county; and with adjacent communities. Final coordination with all concerned is necessary. Personnel must be interested; a training program prepared; and actual field tests and exercises developed and carried out. Volunteers are usually easy to get, but most of them will not stay long unless a constructive program is developed so that they can see and understand that they have a job to do and are being fitted to do it properly.

In commenting on the problems involved in recent operations of an emergency nature involving disaster relief planning—the evacuation of 300,000 refugees in French Indo-China, the Tampico floods in Mexico, and relief to Corozal, British Honduras following Hurricane Janet—the Navy stated: "Had adequate passive defense plans been formulated and effected, much delay and confusion—would have been avoided." Since the Navy in these operations operated with organized and desciplined personnel, it had a very great initial advantage. Without such organized personnel, very little could have been accomplished.

In the Navy's Civil Engineer Corps *Bulletin*, an article "Introduction to Disaster Psychology" stresses the need for a "role" person. "He is a person who conceives himself as being especially qualified to do some job in an (emergency) situation and he tends to act calmly and quickly to do this job in spite of confusion." Such a person is important in time of disaster when effective leadership is most important—even more so than tools and equipment. To develop people with these qualifications, an organization, a procedure and a training program are all necessary.

Texas Organization

The organizational concept of civil defense and disaster relief in Texas was described in a speech by William L. McGill, State Coordinator of Defense and Disaster Relief, before a recent meeting of the Texas League of Municipalities. He said, in part:

"When calamity comes to a community, the officials of its government face an acid test which brings into public scrutiny the extent of their advance preparation, the soundness of their plans, the strength of their organization, their personal capacity for command and the overall effectiveness of their leadership. Just what do you do when telephone terminals are destroyed; when power failure makes radio facilities useless; when there are no means of communications for a county or a city in the time of its greatest need? How do you get ambulances, fire trucks, and rescue vehicles through streets which are deep in rubble and debris; how do you refuel bulldozers, and maintain draglines and dump trucks on the spot; what happens when gasoline is supplied from fuel pumps operated by electric power, when there

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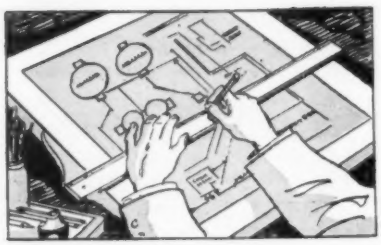

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is no power to be had; how do you protect your people when the public water supply is contaminated; where can you get 10,000 gloves; a hundred house jacks; 350,000 sandbags, 10,000 yards of twine to tie up the sandbags, and knives to cut the twine; how can you police a stricken area and prevent looting. Ambulances are taking the injured to hospitals that were filled hours ago, no central dispatching, no coordination, no plan. We need food for five thousand people and shelter and warm clothes. People are homeless; people are hurt; people are afraid.

"Our first job in civil defense and disaster preparedness planning is to provide an orderly, understandable, feasible, and effective plan for the integration of effort of all local governmental agencies and services which are in existence and available at this time.

"The resource is already at hand —fire, police, health and welfare, engineering, utilities and all the rest—trained and capable people—fully acquainted with their community, and able to protect it and serve it in time of crisis, as they do in their everyday performance.

"The second job results from the obvious fact that the professional forces of government are totally inadequate in number to handle a situation resulting from a fair-sized tornado, to say nothing of the explosion of a 14 megaton H-bomb. So the forces of government must be augmented by volunteers, who will be trained by the regular services, given their duties and their stations, and be ready for action when the emergency is at hand.

"Our third job is to urge continually that the individual citizen become self-reliant and self-sufficient—learning the basic principles of first aid, of fire-fighting, of home nursing, and the techniques of rescue; and joining with others in forming plant and institutional and neighborhood organizations through which aid can be given to people who are in distress.

"A central control center for disaster operations—with appropriate alternate centers—should be established and a complete disaster operational plan developed so that every official, trained volunteer, organization, institution and agency, will start automatically to perform the assigned task, eliminating frantic telephoning, conferring, and scurrying about when the crisis is at hand.

"In this control center there should be adequate communications equipment, maps, charts, resource data, and plans of procedure."

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In-Service Training

(*Continued from page* 172)

program for 2½ years with progressive salary increases based on merit.

The experienced employees under 30 years of age who are instrumentmen or inspectors like it because it gives them a chance to compete on equal terms with the college graduates. Many of these men have enrolled in night schools, correspondence courses, etc., to prepare themselves for the entrance examination, and once in the program have done well; in some phases such as location and construction they have done a better job than some of the college graduates.

The Administrative heads of the department are afforded an opportunity to come in contact with all new engineering employees regardless of their final permanent assignments. This gives them a chance to sell their phase of the work to the young employee and compete for his services if they are favorably impressed with him.

The program also has proven to be a pool of young engineers who have been impartially screened by the Engineer of Research and In-Service Training and are known to be well qualified for promotion. When positions above the rank of trainee have become vacant this pool has been a source for choosing men to fill these positions. This procedure was followed in selecting the ten trainees peviously mentioned as being promoted above the training program before they had completed it.

The program has been an attraction for the young engineer just finishing college and has helped the Florida State Road Department to meet the competition of industry in getting new employees. It has been an incentive for the experienced employees under 30 years of age to do outside studying so as to qualify for positions of greater responsibilities. It has given the Road Department a pool of well qualified, ambitious young men to choose from in filling various vacancies in the department. It gives the young engineer an opportunity to gain a varied overall experience and thereby choose a permanent assignment he feels that he will do best. It gives all departments a chance to see all the well qualified young engineers and bid for their services if they so desire. It has been a good morale factor in the entire engineering organization. In the two years that it has been in operation it has proven a success.

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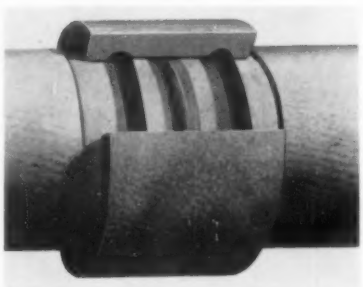
PUBLIC WORKS
EQUIPMENT NEWS

Published Monthly April, 1956

"Fluid-Tite" Coupling Speeds Laying of Water Lines

A new coupling, the "Fluid-Tite", introduced by Keasbey & Mattison, makes it possible to lay more asbestos-cement pipe per hour and it is also said to insure permanent watertight seals. The coupling consists of an asbestos-cement sleeve with two circumferential grooves in the bore and two taper-molded rubber sealing rings with holes in their inner faces. In assembling a pipe joint, the rings are placed in the grooves, and the pipe ends are inserted in the coupling. Fluid under pressure in the pipe enters the holes and expands the rings against the pipe and coupling walls, forming a tighter seal. The joints can be assembled without coupling pullers on pipe in sizes up to and including 8 inches.

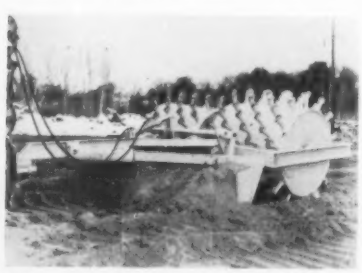


Joint made with the new K&M coupling

However, a lightweight puller is required under certain conditions and with larger pipe sizes. For more details write Keasbey & Mattison, Ambler Penna., or circle **No. 4-1** on the reply card.

Tamping Roller has Strike-Off Blade

A level blade attachment to fit Bros M2 series tamping rollers, and soon to be available for the G2 series, has been announced by Bros. By mounting directly in front of the tamping roller, it levels off the high spots and fills in low spots on the road fill resulting in more even compaction over the entire area of the lift covered by the roller. Raising and lowering movements are made by the tractor hydraulic system through simple take-off connections, or by cable control on tractors equipped with winches. It is 17" high by 112" wide and has a ½" x 6" high carbon steel reversible cutting edge which is replaceable when worn. The attachment replaces the towing tongue on present Bros rollers. Total weight is 1750 lbs. For further information write Wm. Bros Boiler & Mfg. Co., 1057 Tenth Ave. S. E., Minneapolis 14, Minn., or circle **No. 4-2** on the reply card.



Adjustable leveling blade trims high spots, makes compaction more uniform

Slurry Pump Prevents Settling

The outstanding characteristic of this slurry pump announced by Manzel is its ability to pump slurries at rates varying from its maximum capacity of slightly over 15 gallons per hour to a minimum of 2¼ gallons per hour when direct connected to a ¼ hp, 1725 rpm motor. The pump comprises one or more transparent plastic pump heads mounted on a cast iron gear case containing the pump diaphragm operating mechanism and the slurry pump stroke adjuster dial having twenty divisions. This actuates an eccentric to change the stroke of the pump. When adjusted for low rates of delivery, the pump diaphragm is subjected to shunt and rapid pulsations which prevent solids settling out of the slurry. The transparent plastic pump head is suitable for fluid temperatures up to 100° Fahrenheit. It contains the diaphragm chamber, inlet and discharge valves and a sediment trap located below the inlet valve. When two pump heads are mounted on a gear case, one may be used for pumping and the other for water-treating compounds. Complete details from Manzel Div., Houdaille Industries, Inc., 315 Babcock St., Buffalo 10, N. Y. or circle **No. 4-3** on the reply card.

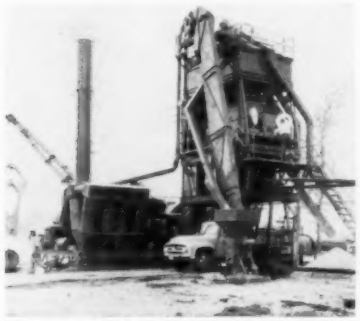
Center Mounted Grader Blade

A new, center mounted grader blade for the IHC 300 utility tractor and other utility tractors has just been introduced by J. R. Prewitt and Sons. Built for heavy-duty work, its center mounting utilizes the full weight of the tractor in maintaining a smooth operation. The six (or eight) foot moldboard angles 30° to the right or left manually and the depth and angle of cut are controlled hydraulically. Ideal for road maintenance and shoulder work, the blade is also used for building driveways, landscaping, terracing, ditching and snow removal. For additional information write J. R. Prewitt & Sons., Pleasant Hill, Mo., or circle **No. 4-4** on the card.

Maintenance and shoulder grading is precise with this tractor equipment

Barber-Greene Adds New Plants To "BatchOmatic" Series

Barber-Greene has announced that their "BatchOmatic" line of automatic bituminous batch plants will



Barber-Greene BatchOmatic plant controls feed of aggregates and bitumen

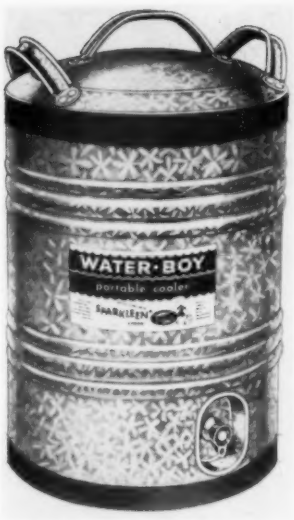
now include 2,000, 4,000 and 6,000 pound models. The new units employ the same features as the original plants, such as simultaneous weighing of all sizes of aggregate; instant change from fully automatic to manual operation; the "Dyna-Mix" pugmill and easy, positive inspection of aggregate gradation and weight. A complete range of sizes of dryers, dust collectors, elevators, and aggregate cold feed systems for the "BatchOmatic" plants are available. Specifications and information from Barber-Greene Co., 400 N. Highland Ave., Aurora, Ill., or circle **No. 4-5** on the reply card.

Hypressure Jenny Steam Cleaner

A new Hypressure Jenny steam cleaner is announced by Homestead Valve. Features of the unit include a new slow-speed positive displacement pump with disc check valves, a minimum of 120 gallons per hour at any pressure, a piano hinged machinery cover for complete and easy accessibility to all working parts, and a remote control to stop and start the machine at the cleaning gun even though the operator may be 100 feet away. The machine is available in eleven different portable or stationary models with a choice of electric motor or gasoline engine drive. For full information write Homestead Valve Mfg. Co., Coraopolis, Pa., or circle **No. 4-6** on the reply card.

Portable Water Coolers With the Sparkleen Liner

The De Luxe "Water Boy" water cans and coolers are dipped galvanized coolers that have the new "Sparkleen" Liner. This Liner is a chemical substance which is sprayed on the interior of the containers and baked on at a high temperature. The lining allows the user to serve any beverage from the container, hot or cold, including coffee or lemonade, without fear of poisoning of any type. The containers have riveted



"Water-Boy" is welcomed on any type of construction job

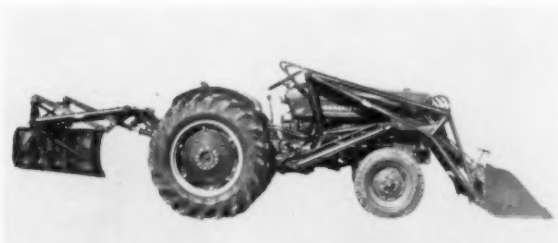
ears and handles, a recessed faucet, which is nickel-plated brass, and double locked seams and bottoms. The containers are furnished in four sizes; 2, 3, 5 and 10 gallons, in both the water cans and coolers. Heavy duty models are furnished in the 3, 5 and 10-gallon sizes. For full details write Schlueter Mfg. Co., 4616 N. Broadway, St. Louis 7, Mo., or circle **No. 4-8** on the reply card.

A New Machine For Highway Stabilization

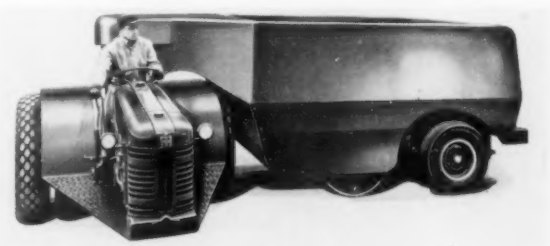
A combination steel-roller and pneumatic-tired compaction unit, providing independent or combined operation for road construction and stabilization has been announced by Seaman-Gunnison. The Duo-Pactor compacts the road bed with steel roller and pneumatic tires to maintain the material assembly of the base materials without segregation. It provides a uniform pressing down and maintains a smooth surface during compaction due to its dual function of rolling. For more information write Seaman-Gunnison Corp., Baraboo, Wisc., or circle **No. 4-9** on the reply card.

Interchangeable Bucket and Dozer Blade Combination

An entirely new Hefti Loader that can be used in the industrial, municipal and construction field is available from Henderson Mfg. Co. The Hefti is unique in that a heavy duty dozer blade and a utility bucket team up with it and the tractor to form a compact, rugged piece of equipment that can perform any number of heavy jobs. The blade and bucket can be mounted interchangeably on either front or rear of loader. The loader is interchangeable between makes of tractors, it not only fits the IHC-300 Utility, but also the Oliver Super 55 and others, with only a small bracket change. The lifting capacity is 2000 lbs., and depth of dig below ground for both bucket and dozer is 9½ inches. For more data write Henderson Mfg. Co., Cedar Rapids Ia., or circle **No. 4-7** on the reply card.



1/3-yd. bucket mounts on either front or rear of tractor



"Duo-Pactor" combines steel roller and pneumatic tires

A 12-Inch Safe-T-Cone Announced

The new Safe-T-Cone announced by Radiator Specialty Co. is 12-inches high with an 8½-in. square base. Three sizes are now available, the 12, 18 and 28-inch Safe-T-Cones. They are available either

New size rubber traffic cone

painted or reflectorized and are designed to support rubber signs, flasher-lights, flags and lanterns. These cones are used by state, county and municipal authorities for the control of traffic during line painting, emergency barricades, street repair, school zones, toll bridges and highways. For details write Radiator Specialty Co., Charlotte, N. C., or circle **No. 4-10** on the reply card.

A New Metal-Enclosed Flexible Valve

A completely sealed, metal-enclosed flexible valve capable of operating under pressures as high as 250 psi has been announced by Farris Flexible Valve. The new Farris Superseal valve has a unique self-aligning drive to pinch off the sleeve body for positive tightness and the light hand wheel torque provides easy manual operation. Also, automatically operated Superseal valves are made in two types: Standard diaphragm motor designs supply available power for most applications and the extra-power types that have diaphragm areas twice those of the standard models. Superseal is built with an inner valve sleeve available in a choice of rubber or synthetic materials. For more data write Farris Flexible Valve Corp., 718 Commercial Avenue, Palisades Park, N. J., or circle **No. 4-11** on the reply card.

New Lightweight Drain Pipe is Moisture and Corrosion Proof

Lightweight plastic pipe is available for sewer-to-house and house-to-septic tank connections. It is resistant to moisture and corrosion and is easy to carry, for ten feet of 4-inch pipe weighs only 14½ pounds. It is claimed one man can install 100 feet of pipe in 40 minutes. To join two lengths of Carlon pipe together, it is

Making a joint in plastic drain pipe

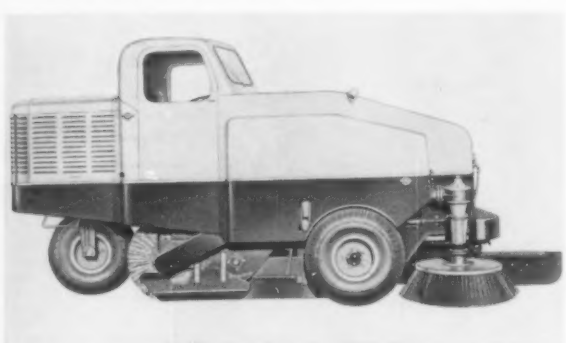
necessary only to brush Carlon cement on the outside ends of the pipe and inside the coupling, then push together. The pipe comes in 10-foot lengths in 2″ to 6″ sizes with a complete line of reducers, adapters and couplings for special sizes and angles, and for coupling other types of pipe. For further information, write Carlon Products Corporation, 10225 Meech Ave., Cleveland 5, O., or circle **No. 4-13** on the reply card.

New Cab-Over-Engine Trucks

A completely new line of 12 trucks featuring cab-over-engine design has been introduced by Four Wheel Drive Auto Co. The new trucks all are four-wheel drives in gross vehicle weight classifications of 14,500 to 40,000 pounds. They vary in horsepower from 131 to 240; have from four to 12 transmission speeds, depending upon model; and are for utility line construction and maintenance, highway maintenance and construction, snow-plowing, heavy construction hauling and similar tasks. The new FWD cab-over-engine style also is available for special six-wheel drive applications. For information write Four Wheel Drive Auto Co., Clintonville, Wisc., or circle **No. 4-14** on the reply card.

Sweeper Has Hopper Capacity of Four Cubic Yards

A street sweeper that will pick up and carry to a central dump more than 4 c.y. of dirt and litter has been announced by Wayne Mfg. Co. The Model 550 offers as standard equipment power steering, power brakes, pickup broom adjustment from inside the operator's cab, and a Fibreglas cab with safety-glass roll up windows. The gutter broom is placed ahead of the front wheels to make possible full vision of both traffic conditions and sweeping operation. The floating action brooms automatically raise or lower to sweep clean in depressions, such as indented drains, or over high places. Power is furnished by a 148-hp, V-8 industrial type engine. For complete information write Wayne Mfg. Co., Pomona, Calif., or circle **No. 4-12** on the reply card.



Modern design and big load capacity mark the 550 sweeper

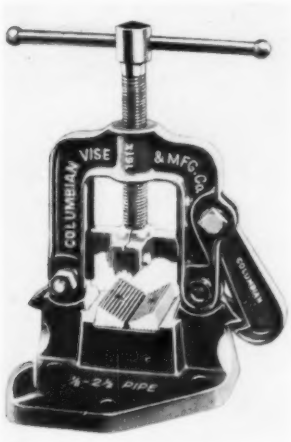
One of 12 new C.O.E. trucks introduced by Four Wheel Drive

"Epibond" Adhesives For Clay Pipe

A new and unique epoxy paste for bonding clay pipe has been announced by Furane Plastics. This paste is available in cream or aluminum color and in various consistencies. It is chemically resistant to most acids, alkalies, sewage effluents, and some solvents, and sets hard at room temperature. For full details write Furane Plastics, 4516 Brazil St., Los Angeles 39, Calif., or circle **No. 4-15** on the reply card.

"Long Jaw" Hinged Pipe Vise

An improved "Long Jaw" hinged pipe vise is announced by Columbian. Outstanding features are reversible lower jaws that can be easily reversed or replaced without removing the vise from the bench. Available in 4 models, pipe capacity ranges from ⅛ to 2 inches to ⅛ to 4½ inches. Full details from the Columbian Vise & Mfg. Co., Cleveland, Ohio, or circle **No. 4-16** on the reply card.



Paint Marking Machine Can Get Between Parked Cars

A new gravity-feed marking machine, with triple the paint capacity of standard hand models, has been introduced by H. C. Sweet. Called the Florline-King, it holds 5 gallons of paint, lacquer or whitewash and still maintains lightness of weight, easy handling and storage. It is ideal for making lines around and between cars and there is no need to clear areas to be painted or to paint in costly off-hour periods. Curved, straight or skip lines can be made with a minimum of operator direction. For full details write the H. C. Sweet Co., 12345 Telegraph Rd., Detroit 39, Mich., or circle **No. 4-19** on the reply card.

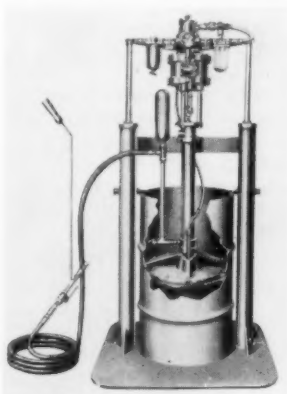
Compact marker works in tight places

Tractor-Lift For Many Municipal Uses

The "Tracto-Lift", announced by Ottawa, is a heavy duty fork lift truck specially designed for outdoor use in moving bulky materials over rough or muddy terrain. It is available in sizes ranging from 1,000 to 15,000 pounds capacity, with fork lengths of 30 to 108 inches. Heavy duty industrial engines are utilized as the basic power units, and the larger series of Tracto-Lifts are equipped with extra heavy axles and bearing assemblies. Its maximum underneath clearance enables it to drive over concrete blocks, stumps or logs without difficulty. It is well balanced and carries the load over the traction wheels, making it possible to carry a heavier load without adversely affecting the steering. For complete details write to Ottawa Steel Division, L. A. Young Spring & Wire Corp., P. O. Box 39, Ottawa, Kansas., or circle **No. 4-17** on the reply card.

Joint Sealer Pumps Cold-Applied Compounds Direct From the Drum

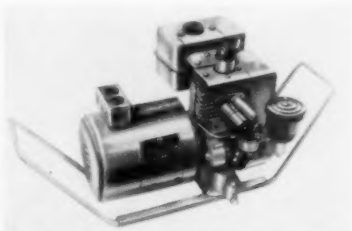
A new joint sealer for applying cold sealing compounds to pavement joints, announced by Clipper, is a complete, ready-to-use unit requiring only connection to a suitable air compressor for operation. The Model CP-400 consists basically of two vertical air cylinders which straddle the 55-gallon material drum and they are connected at the top by a crossbeam which supports an air pump. The lower extension of this pump is attached to a drum wiper plate which enters the material drum. The drum wiper plate does not "push" the material, rather it serves to maintain an even level of sealing material which is pumped out of the drum by the air pump. For more data write Clipper Mfg. Co., 2800 Warwick, Kansas City 8, Mo., or circle **No. 4-20** on the reply card.



Applicator for cold sealers

Portable Electric Plant Has 1000-Watt Capacity

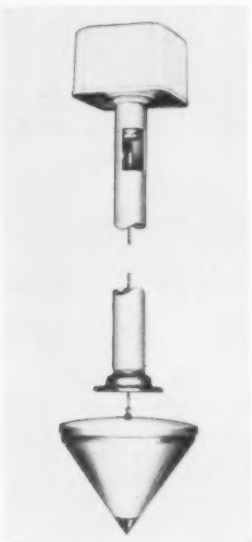
A brand-new, light-weight 88 lb. Briggs & Stratton engine-driven Electric Plant, rated 1000 watts continuous duty, is now available from International Fermont Machinery Co. The plant comes as a completely operable "Basic Unit" and is a manual-starting, 2-wire, 60-cycle, AC, single-phase set. The engine is equipped with air filter, fuel system and tank, ignition system (radio shielded), lubrication system, governor and muffler. The entire unit is permanently alined and mounted on a steel-base-and-carrying handle combination. Special accessories include a residential silencer, 3-foot flexible hose, 2-wheel dolly with handle and 2-wire 50-cycle operation. For more data write International Fermont Machinery Co., Inc., Ramapo, N. Y., or circle **No. 4-18** on the reply card.



This light-weight generator is rated at 1000 watts, can supply 15% overload

Immersed Float Vacuum Transmitter

An immersed float vacuum transmitter, primarily designed for use with F&P automatic proportioning chlorinators, has been developed by Fischer & Porter. The transmitter—a force balance type with no moving parts—gives a vacuum signal proportional to the main line water flow. The signal governs the amount



Arrangement of the float and vacuum transmitter support

of chlorine introduced into the system by the chlorinator. The equipment is suitable for use in Parshall flumes, Kennison nozzles and weirs. It is unaffected by chlorine, sewage gases or weather and virtually no maintenance is said to be required. Standard float sizes range from 5 to 30 inches in five-inch increments. For details write Fischer & Porter Co., 555 Jacksonville Rd., Hatboro, Penna., or circle **No. 4-21** on the reply card.

New Lift Cuts Maintenance Costs

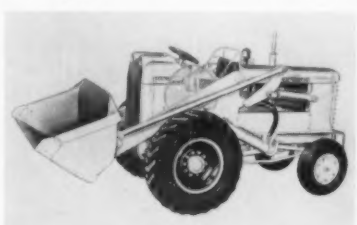
A new portable, all-hydraulic, elevating work platform, the Hy-Deck, which fits any size or type of truck for aerial work up to 37 feet high, has just been introduced by G. W. Galloway. The Hy-Deck, which raises 500 pounds to full height in less than 2 minutes, can be a great time saver in the maintenance of outdoor lighting, power and communications lines, tree trimming and other overhead maintenance activities. Available with electric motor, gasoline engine, or power take-off, the work platform can be raised and lowered by means of foot controls on the platform floor, or by hand controls mounted on the truck body. The twelve different sizes and styles of platforms fit a wide variety of specialized uses. The platforms are equipped with a collapsible aluminum guard railing which can be folded when the platform is down, making the entire assembly only slightly higher than the truck cab. For details write G. W. Galloway Co., 25 N. Fourth Ave., Arcadia, Calif., or circle **No. 4-22** on the reply card.

Mall Concrete Vibrator

A new, universal motor-in-head concrete vibrator has been announced by Mall. It operates from ordinary 115 volt house current and eliminates the necessity of generating equipment where house current is available. Vibration frequencies up to 10,000 per minute produce an effective, yet gentle result that does not damage forms. Another advantage is the vibrator's safety sealed-in switch and a thermal overload device that protects the motor-in-head from overheating. Full details from Mall Tool Co., 7725 South Chicago Ave., Chicago 19, Ill., or circle **No. 4-23** on the reply card.

1⅛-yd. Tracto-Loader

Another addition to the line of front-end loaders is announced by Tractomotive with the introduction of the TL-11 Tracto-Loader. The 1⅛-cu. yd. loader has front wheel drive for better traction and is equipped with rear wheel power steering. It has a 3:1 torque converter and a clutch-type transmission which permits changes in the direction of travel without shifting gears. Maximum clearance under the hinge pin when dumped is 10′ 3″, and at this dumping height the machine has a reach of 2′ 7½″. Power is furnished by either a 63-hp, 4-cylinder gasoline engine or a 77-hp, 6-cylinder diesel. More information from Tractomotive Corp., Deerfield, Ill., or circle **No. 4-24** on the reply card.



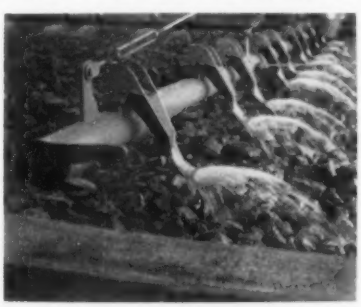
New unit has large lifting capacity

New Air-Powered Pipe Puller and Pusher

New air-powered pipe puller and pusher that takes the hard work out of the pushing and pulling operation has been announced by Trojan. Designed to handle pipe up to 2-in. in diameter without additional dogs, clamps or wedges, this new air-powered model is operated by simply regulating a control valve. It has three pushing speeds for different types of soil and can be changed from pushing to pulling position in 30 seconds. The machine uses a 30-in. long push pipe and requires only a 5½-ft. trench for operation. For details write the Trojan Mfg. Co., 1505 Race Drive, Troy, Ohio, or circle **No. 4-25** on the reply card.

Rotary Distributors For Trickling Filters

The Gard, a rotary distributor for trickling filters, is now being supplied by General Filter. The distributors are made in standardized



2, 3 and 4-arm units depending upon size and load requirements. They are claimed to provide an even distribution of water from the aluminum reactors and free flow through the open-weirs, allowing grease and large particles to pass without clogging. The distributor can be made

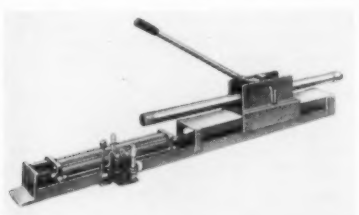
to fit any existing base and can be operated by dosing siphons or from recirculation systems. For full data write General Filter Co., Ames, Ia., or circle **No. 4-26** on the reply card.

A Portable Air Pruner

A new type of portable air pruner, designed to reduce tree trimming time, has been introduced by Weed Control. The pruner is unique in design, with the motor located next to the saw blade and the entire unit weighing less than 5 pounds. The 7" blade revolves at up to 5000 rpm, with a cutting capacity up to 4 ins. Overall length is 76". It operates best at 140 psi and uses 17 to 20 cubic feet of air. For further information write Weed Control Service, Inc., Portland, Oregon, or circle **No. 4-27.**

Hydraulic Pipe Pusher

Rapid underground crossing with pipe or conduit beneath streets, highways, railroad tracks or other situations where such crossing is desired is available through the use of the new "Speed-Thru" hydraulic pipe pusher. The two models available handle ¾ in. to 4 in. pipe or conduit and call for one man operation. The pushers come powered by gas engine, DC truck power or AC electric hydraulic power units as desired. By reversing the forward pushing principal without the necessity of turning the machine,



it will pull pipe, facilitating installations of copper or plastic lines, For full details write Mercury Hydraulics, Inc., 2440 Blake Street, Denver Colo., or circle **No. 4-28.**

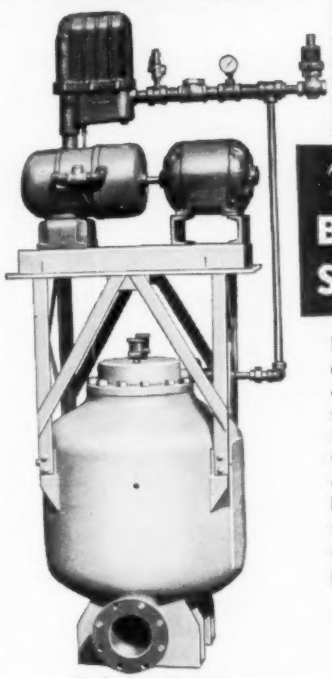
• • •

Meeting Announcements

The New York State Sewage and Industrial Wastes Association will hold its 1956 Spring Meeting May 28-29 at the Hotel Statler in Buffalo, New York.

The 28th Annual California Sewage & Industrial Wastes Ass'n conference will be held at Santa Rosa, Calif., April 25-28. Headquarters will be at Hotel Santa Rosa. The Secretary is J. C. Mallery, 4822 Dunsmore Ave., La Crescenta, Calif.

LOOK!



Single Type Compact Self Contained Ejector System

Blackburn-Smith Mfg. Co.
59 Garden Street, Hoboken, N. J.

I want to know how I can get better sewage ejection at lower cost.

Name .....
Company .....
Address .....
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The How and Why of
BETTER, LOW COST SEWAGE EJECTION

If you want to get rid of complex piping, to eliminate screens, impellers, shredders, with their clogging and constant costly pump cleaning . . . send the above coupon for our Engineering Bulletin S50. If you want to lift sewage 150 feet at 30 to 500 g.p.m. without failure or mess or big bills . . . you'll want the facts in this Bulletin. Blackburn-Smith Sewage Ejectors in single and twin units are rugged, more economical and sanitary. Their reputation for dependable service is unsurpassed.

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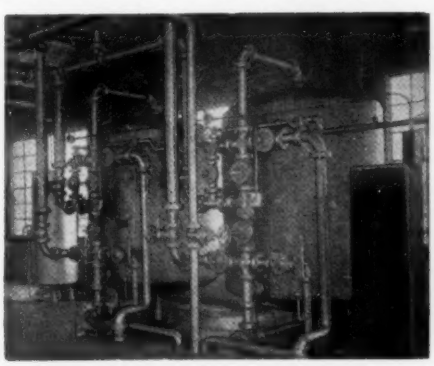
LAKESIDE HAS THE ANSWER to Your Hard-Water Problems

Lakeside uses different kinds of zeolites and accessories to meet your particular needs in a softener. Such care insures high capacity, minimum cost, long life and ease of operation. Bulletin 78 tells you a great deal about zeolite softening, including the capacities of the various zeolites, how to determine the amount of zeolite required and how to compute the dimensions for any softening unit.



Sectional drawings show the details of construction of the softeners, and full data are presented on manual, semi-automatic and fully automatic control.

Send for Bulletin 78 now if you have a hard water problem.

LAKESIDE ENGINEERING CORP. 222 West Adams Street Chicago 6, Ill.

Thousands use our Readers' Service card to keep up to date . . . do you?

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—Worth Seeing

Next time you drive to Glacier National Park, Montana, you will ride over this Armco Multi-Plate pipe-arch if you use the alternate route through scenic Swan Valley. The arch shown was assembled beside the creek and bulldozed into position. An Ingersoll-Rand 534 impact wrench powered by a LeRoi compressor lent powerful construction assistance.

Welded rigid frame structure, 200 x 400 feet, where future Ohio State University teams can practice football indoors with no more regard for rain, hail, snow or darkness than the postman. Lincoln Jetweld electrodes were used here.

Fish must be served! This remodeling job on a fish hatchery in Dallas is being done by two Park Department Huber-Warco Maintainers. In their spare time the machines are preparing baseball diamond infields, ready now for spring.

Highway building and maintenance are among hundreds of vocations for which this new Dodge Town Wagon truck was engineered. Built on a half-ton truck chassis, it will haul a payload of 1650 pounds or carry eight passengers.

Vacuum cleaning an airport runway is no small feat, but this Hoffman "Jarc" picks up everything from roofing nails to last Sunday's newspaper. Mounted on a White Motors truck chassis, it will clean up 2 million sq. ft. in 8 hours.

POWER *ON THE JOB... ON WHEELS!*

Model 45 MGW 4

Also available with carrying brackets

with

Katolight **PORTABLE POWER PLANTS**

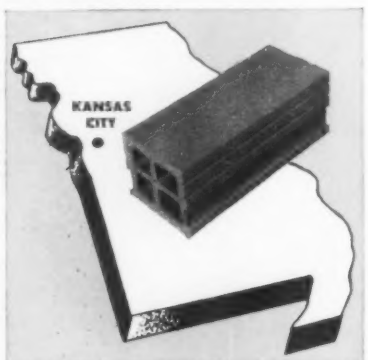
Yes, Katolight Portable Power Plants, wheel-mounted or with carrying brackets, bring electricity where you want it — when you want it — and save money doing it! In daily use by municipal departments throughout the country. Wide selection of Katolight Plants, driven by air or water-cooled gasoline engines, up to 50 KW. Also, Motor Generator Sets, High Frequency Changers and Independent Generators up to 500 KW.

IT'S NEW! SEND FOR FREE FOLDER ON NEW LIGHTWEIGHT PORTABLE MODELS

Katolight CORPORATION

Box 891-107 Mankato, Minnesota

Another NEW Leopold Installation...



New 48 mgd Kansas City, Mo. plant equipped with Leopold Filter Bottoms

For top performance, use Leopold Bottoms. They work better . . . last longer. Write today for complete details.

F. B. LEOPOLD CO., INC.
2413 W. Carson Street, Pittsburgh 4, Pa.

WORTH TELLING

by Arthur K. Akers

Mr. Stockwell

★ MEET THE NEWEST addition to PUBLIC WORKS' advertising sales staff, C. H. Stockwell, 600 Graphic Arts Building, Kansas City 5, Mo. "Jake" now looks after the interests of our friends from there; east to Jefferson City, north through Nebraska, south to the Gulf shores of Texas. Growth of that area and its advertising make this necessary.

★ SO WE WENT to the magic island of Bermuda to get warm in February, to come away the Bermudiana Hotel's and General Manager Carroll Dooley's best friend. British Overseas Airways' martinis and the Bermudiana's rum swizzles do things *for* you—not *to* you!

★ JAMES B. CLOW & SONS, Inc., announces a new pipe plant at Bensenville, Ill. as part of a $5 million expansion program to keep pace with the nation's burgeoning demands for pipe. Centrifugally cast pipe, 4 through 16 inches in 18-foot lengths will be its product.

★ HOMESTEAD VALVE Manufacturing Co. expands its main plant, at Coraopolis, Pa., too, to meet a 49% increase in sales.

Mr. Bramlage

★ WILLIAM BRAMLAGE is new advertising and sales promotion manager for Littleford Brothers Inc., Cincinnati, makers of road building equipment, succeeding R. G. Hext. Graduate of the University of Cincinnati with a B.S. degree in advertising, Bramlage was formerly with the advertising department of the Globe-Wernicke Co.

★ PFAFF & KENDALL, Newark, N. J. makers of lighting standards, advances Michael Dingman to sales manager of its Micro-Balancing Inc. subsidiary to promote sales of its Lumatrol line of photo-electric street lighting controls.

★ HEIL PRODUCT CO., Clifton, N. J., adds Paul B. Pugh Jr., formerly of Gar Wood Industries, to its sales staff for Heil "Colectomatic" refuse bodies.

★ THE PERMUTIT CO., New York, adds emphasis to its advances in the industrial wastes treatment field with the promotion of Charles Bueltman to manager of that department.

Mr. Bueltman

Mr. Byrd

★ GAR WOOD INDUSTRIES Inc. names Dave Byrd as sales manager for their Load-Packer refuse collection bodies, succeeding Harold Clark who becomes sales manager of their construction equipment division, Findlay, Ohio.

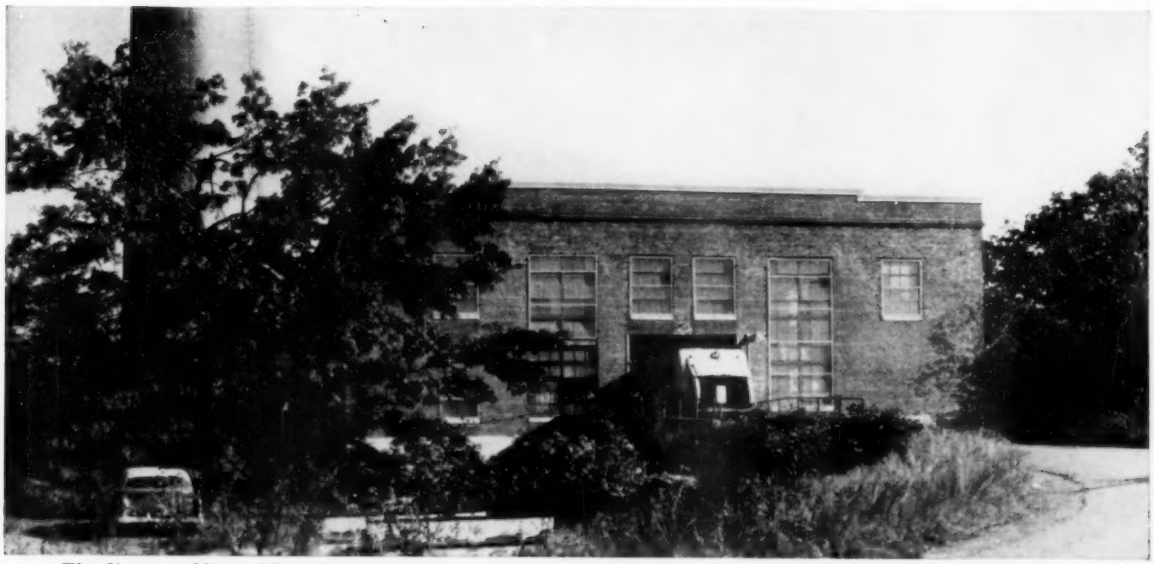
★ A. C. ANDERSON Inc., Wildwood, N. J., has acquired the Lessmann Manufacturing Co., Des Moines, to increase manufacturing and distribution facilities for the Anderson Highway Mower. Production of the Lessmann Loader will continue.

★ EUCLID DIVISION, General Motors, has a new color, sound movie, "Under the Shovel." Available on request from Euclid, Cleveland 17, Ohio.

★ WHITE FRIEND to Georgia colored boy: "Why are you so worried about your trial? You'll get justice up at the court house."

"Boss, I knows it—and that's exactly what I'se scared of."

Another Norton Rx *on the job!*



The Newton, Mass., Municipal incinerator, recently modernized. General contractors: John F. Griffin Co., Cambridge. Refractory contractors: D. Antonellis, Inc., Brighton. CRYSTOLON *engineered and prescribed* refractories were specified.

Around the grate of the Newton incinerator, CRYSTOLON brick was installed in back and side walls, up to 3 feet above the sloping, movable grate.

CRYSTOLON brick was also used around the doors leading to grates, and for the front wall over the stoking door. Door arches and jambs are made of special CRYSTOLON shapes. Photo taken during installation.

Complete overhauling of Newton, Mass., incinerator includes extensive use of CRYSTOLON refractories to protect trouble-spots.*

In the modernization of old incinerator plants, just as in the building of new ones, the use of Norton *engineered and prescribed* refractories is the mark of up-to-the-minute construction methods.

For example, when the Newton incinerator was overhauled, CRYSTOLON refractories were the logical Rx's for various critical areas. The reason:

Exceptional resistance to slags, clinkers and abrasive refuse . . . ability to withstand temperatures up to 3050°F . . . great physical strength and resistance to thermal shock and chemical attack . . . up to 15 times the resistance of ordinary fire clay to erosion and corrosion . . . extra-long, trouble-free service life.

Investigate how these or other Norton refractory Rx's can save time, money and work in your own furnace operations. See your Norton Representative or write to NORTON COMPANY, 223 New Bond Street, Worcester 6, Mass. Canadian Representative: A. P. Green Fire Brick Co. Ltd., Toronto 5, Canada.

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The **WT** Silactor® provides another important benefit to plant operation because all of the chlorine used in this continuous process is available for the usual chlorine reactions. There are no wasted chemicals.

For complete information about the **WT** Silactor®, ask your local Wallace & Tiernan representative for Catalog File 60.110, or write to the address below.

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